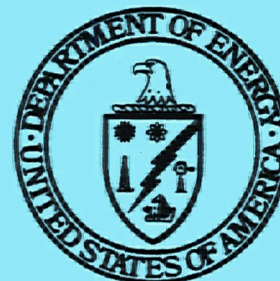


**Monticello Mill Tailings Site**

# **Declaration for the Record of Decision and Record of Decision Summary**

**August 1990**

**U.S. Department of Energy  
Idaho Operations Office  
Grand Junction Projects Office  
Grand Junction, Colorado**



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MONTICELLO MILL TAILINGS SITE

DECLARATION FOR THE RECORD OF DECISION

19028

MONTICELLO MILL TAILINGS SITE  
DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Monticello Mill Tailings Site

San Juan County, Utah

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Monticello Mill Tailings Site (Operable Units I and II) in San Juan County, Utah. The selected remedial action was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and the National Oil and Hazardous Substances Pollution Contingency Plan. This decision document explains the factual and legal basis for selecting the remedy for this site.

The State of Utah and the Environmental Protection Agency concur with the selected remedy. This remedial action decision is based on the administrative record for this site.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The selected remedies for Operable Units I and II are described in this Record of Decision. Final remediation of Operable Unit I, Mill Tailings and Millsite Property, requires completion of the selected remedy for Operable Unit II, Peripheral Properties. Remediation of Operable Unit III, Ground Water and Surface Water, will be addressed in a separate Record of Decision as it requires implementation of the selected remedy for Operable Units I and II. A summary of the extent of contamination in Operable Unit III has been included in this Record of Decision to assist in defining the extent of contamination from the millsite.

Operable Unit I - Mill Tailings and Millsite Property

Remediation of this operable unit is the first of three final actions that are planned for the site. Operable Unit I addresses the source of contamination by excavation of uranium mill tailings and other by-product materials (as defined in Section 11(e)(2) of the Atomic Energy Act of 1954 as amended, and in 40 CFR Part 192 as "tailings or waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content"), contaminated buildings and equipment material, ore, and contaminated soils on the millsite that present a source of ground-water contamination or threat of direct exposure. After excavation, the contaminated material will be contained in a repository that will be built approximately one mile south of the present millsite. The remedy addresses the principal threats at the site, which are associated with radon emissions and direct exposure to gamma radiation from the existing mill tailings piles.

The major components of the selected remedy for Operable Unit I include:

- Removal of approximately 1.5 million cubic yards of tailings, ore, and process-related material (by-product material, contaminated building materials, and mill equipment) from their present location where they are within the floodplain of Montezuma Creek or are in contact with the ground water to a repository one mile south of the present mill tailings site. The repository would be designed to meet requirements of the Uranium Mill Tailings Radiation Control Act of 1978 and the Uranium Mill Tailings Remedial Action Program technical standards. These standards require the repository be effective for up to 1,000 years to the extent reasonably achievable, and that the escape of radon gas be controlled to within acceptable limits. This remedy has been determined to be an on-site remedy pursuant to the National Contingency Plan.
- Capping the repository to protect the ground water, isolate the waste from the environment, and to control the escape of radon gas:
- Construction of surface-water controls necessary during remedial action construction activities and for the repository:
- Treatment of contaminated runoff water and construction/dewatering water collected during construction activities in accordance with applicable standards prior to release to the environment, with disposal of residuals in the repository or another licensed repository. Treatment may be performed by evaporation, reverse osmosis, or another appropriate technology and will be determined during the design stage:
- Revegetation of the millsite and repository site:
- Long-term surveillance and environmental monitoring to ensure the effectiveness of the remedial action and compliance with ground-water and surface-water standards:
- Land acquisition and access control as necessary.

#### Operable Unit II - Peripheral Properties

Remediation of this operable unit is the second of the three final actions planned for the site. Remedial action at Operable Unit II addresses the removal of radioactively contaminated soils and processing by-product materials located on peripheral properties. The remedy would reduce radiation exposure to the public by either removing contaminated materials by conventional construction techniques or environmentally sensitive construction techniques, or by proposing the use of supplemental standards. As allowed under the principal relevant and appropriate requirement, supplemental standards allows leaving some or all of the contamination in place where removal would cause undue environmental damage. Materials removed from the properties would be placed on the existing tailings pile for final disposal with tailings from Operable Unit I. In areas where supplemental clean up standards under Title 40 Code of Federal Regulations, Part 192.22 could apply (the cemetery and densely vegetated hillsides south of Montezuma Creek), institutional controls may be used to restrict access and control the use of the land to prevent future exposure.

The major components of the selected remedy include:

- Removal of an estimated 300,000 cubic yards of tailings from peripheral properties and eventual disposal in the same repository as described for Operable Unit I:
- Vegetation after removal of tailings:
- The use of institutional controls, if necessary.

Operable Units I and II are scheduled to be completed over a 5-year period. Reviews of the selected remedy are scheduled under the Comprehensive Environmental Response, Compensation, and Liability Act at five-year intervals, commencing with the initiation of remedial action.

#### Operable Unit III - Ground Water and Surface Water

Remedial action of Operable Unit III addresses clean up of ground-water and surface-water contamination. The Upper and Lower Montezuma Creek peripheral properties will also be remediated in this operable unit. During the remedial action of Operable Units I and II, the characteristics of the ground water in the alluvial aquifer and the surface water in Montezuma Creek (Operable Unit III) will be altered. Remedial action construction activities will cause the following changes:

1. Surface water, a principal source of ground water, will be diverted around the site. This will cause unknown effects in the attenuation and chemical properties of soils below the site.
2. The soils in the alluvial aquifer contaminated by mill tailings or leachate will be excavated to the standards in 40 CFR 192 during the remedial activities proposed for Operable Unit I. The contaminated pore water retained in the excavated soils will be removed with the soils.
3. During construction, portions of the site must be dewatered to facilitate removal activities thus removing a large amount of water from the alluvial aquifer. All water from dewatering of tailings and soil and from construction activities will be treated and released to the environment in compliance with the applicable requirements.

The results of these changes will have an unknown effect on the characteristics of the aquifer.

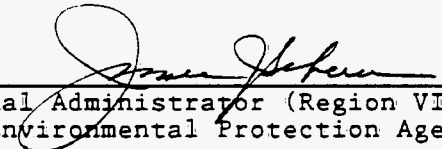
Throughout remediation of Operable Units I and II, a ground-water and surface-water monitoring program of the alluvial and Burro Canyon aquifers will be conducted upgradient from, downgradient from, and on the millsite. This monitoring program will continue for three years after removal of the contaminated material. As monitoring continues during the three year period, the U.S. Department of Energy, the U.S. Environmental Protection Agency, and the State of Utah will periodically review the results of the monitoring program and determine what additional steps, if any, will be required to complete aquifer restoration. When sufficient data have been gathered through a focused remedial investigation/feasibility study to warrant a final decision for ground-water and surface-water restoration, a Record of Decision will be produced for Operable Unit III.

Institutional controls, including buying or leasing of land and water rights, will be implemented for Montezuma Creek and the alluvial aquifer prior to remedial action construction on Operable Units I and II. These controls will be maintained until such time as a decision is made regarding surface-water and ground-water remediation.


# Declaration of Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State of Utah requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable for this site. This remedy does not satisfy the statutory preference for treatment as a principal element for several reasons. Due to the large volume of contaminated materials, treatment is not practicable. Further, none of the proven treatment technologies available for radiological contaminants reduces the total volume or toxicity of these contaminants, nor do they irreversibly reduce contaminant mobility. Technologies that could reduce the total volume of contaminated soil produce residuals that would present a threat to human health and the environment.


Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

  
\_\_\_\_\_  
Regional Administrator (Region VIII)  
U.S. Environmental Protection Agency

8-22-90  
Date

  
\_\_\_\_\_  
U.S. Department of Energy  
Idaho Operations Office Manager

9/20/90  
Date

  
\_\_\_\_\_  
Concurring in this determination:  
State of Utah,  
Department of Health

21 Aug 1990  
Date

MONTICELLO MILL TAILINGS SITE  
DECISION SUMMARY FOR THE RECORD OF DECISION

MONTICELLO MILL TAILINGS SITE  
DECISION SUMMARY FOR THE RECORD OF DECISION  
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MONTICELLO MILL TAILINGS SITE  
DECISION SUMMARY FOR THE RECORD OF DECISION

1.0 SITE NAME, LOCATION, AND DESCRIPTION

The Monticello Mill Tailings Site (the site) is located in San Juan County, Utah, near the City of Monticello (Figure 1-1), in the southeastern corner of Utah. Mill tailings and associated contaminated material remain on the millsite as a result of milling for uranium and vanadium. The tailings piles are within the floodplain of Montezuma Creek and are partially in contact with an alluvial aquifer. Tailings particulate material has been windblown and transported by surface water to properties peripheral to the millsite. The site is bordered by land owned by the U.S. Department of the Interior's Bureau of Land Management, the City of Monticello, and private owners. No residences are located within the millsite boundary, but residences are adjacent to the north and east edges of the site. The City has a population of approximately 1,900.

The site includes the millsite, where radioactive tailings and associated contaminated material are located, and peripheral properties. The millsite, a 78-acre tract within the City of Monticello, is owned by the U.S. Department of Energy. During the period of mill operation, private land to the north and south of the existing site was leased for the stockpiling of ore. The former ore-stockpile areas and areas contaminated by airborne-tailings particulate matter or surface-water transport cover approximately 300 acres around the site and contain most of the estimated 300,000 cubic yards of peripheral property material to be remediated. Peripheral properties also include the bed and banks of a 3.3-mile reach of Montezuma Creek between the City of Monticello and Vega Creek.

The millsite consists of the former mill area and the tailings-impoundment area. An estimated 100,000 cubic yards of contaminated material have been identified in the mill area; and approximately 1.4 million cubic yards (2 million tons) of tailings, contaminated soil, by-product material, and contaminated building material are located in the tailings-impoundment area. Figure 1-2 depicts the millsite property, associated buildings, and tailings piles.

The tailings are contained in four piles. These piles are located within the floodplain of Montezuma Creek. They are also partially in contact with a shallow alluvial aquifer underlying the site. This alluvial aquifer is not presently used as a private or public drinking water source. However, it does have a potential for agricultural use. A deeper aquifer, Burro Canyon, is used as a drinking water supply and monitoring has shown no evidence of contamination. Two aquitards, the Mancos Shale and part of the Dakota Sandstone, separate the Burro Canyon aquifer from the overlying alluvial aquifer under most of the millsite.

Montezuma Creek, which flows through the millsite, is a small perennial stream with headwaters in the Abajo Mountains immediately west of Monticello. Low-flow conditions prevail in the late summer, fall, and winter months. Within the project area, base flow in Montezuma Creek is maintained year-round by ground-water discharge from the alluvial aquifer and by releases from Monticello Reservoir (located on South Creek, one mile west of Highway 191).

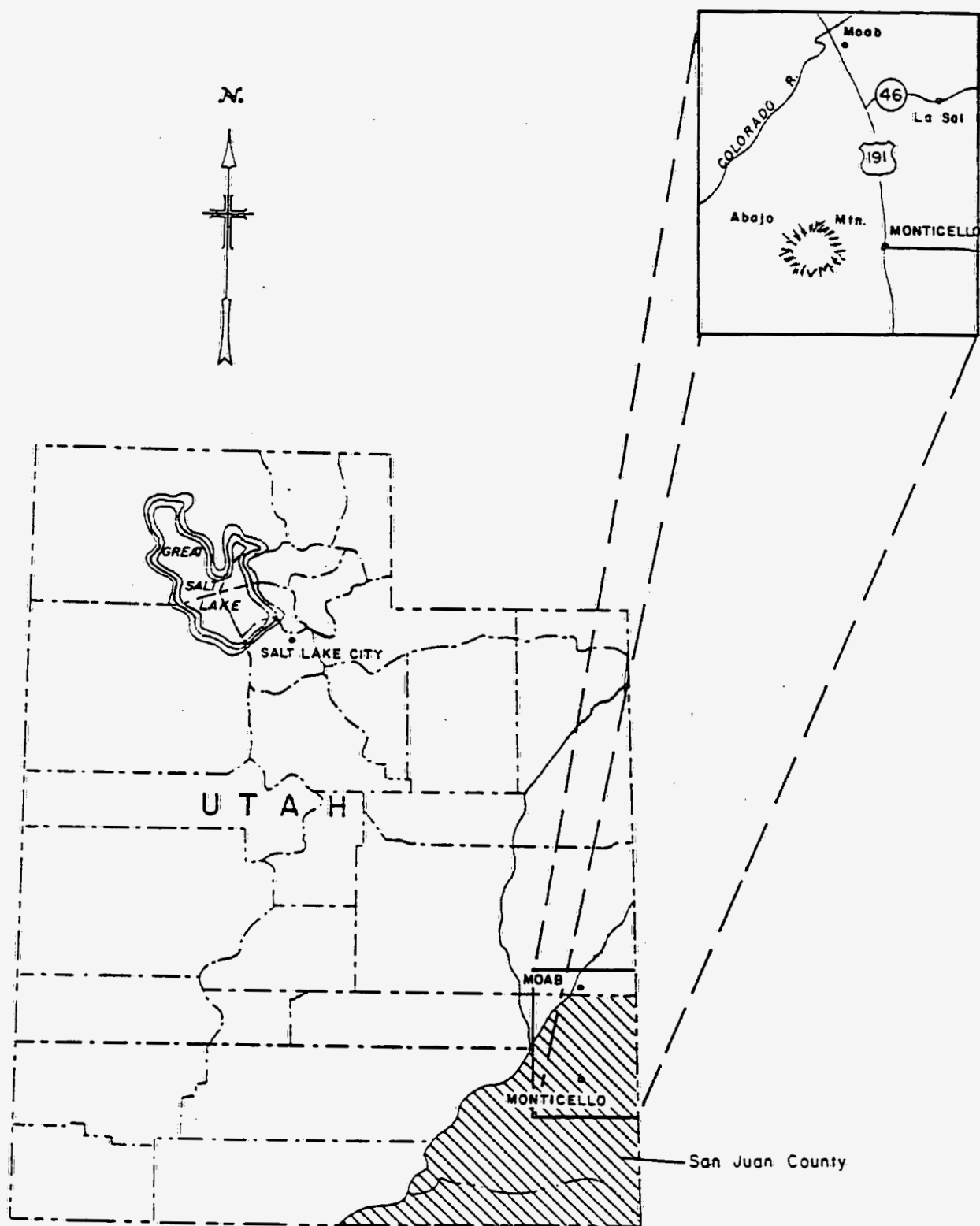


Figure 1-1. Monticello, Utah, Regional Location Map

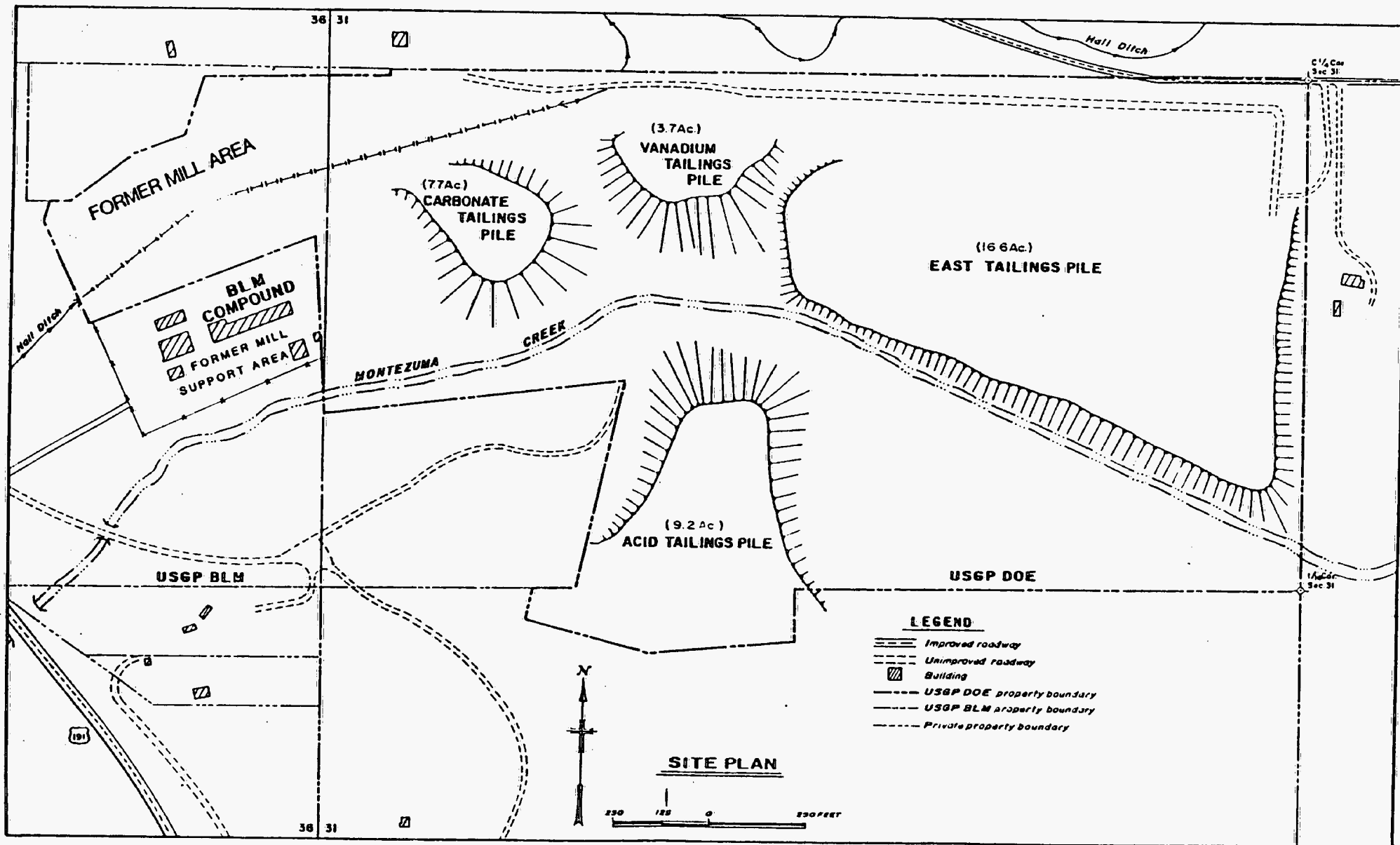


Figure 1-2. Monticello Millsite Site Plan

Domestic surface-water resources for the Monticello area are located topographically upgradient from the site. The source of domestic water for those people living outside the City of Monticello is predominantly ground water, drawn chiefly from wells drilled into the Burro Canyon aquifer.

The total annual average precipitation for the Monticello area during the period of 1982 through 1986 was 18.3 inches. The annual average potential evapotranspiration is 24 to 26.9 inches.

The prevailing winds are generally from the south, west-southwest, and northwest. The strongest winds, ranging from 7 to 13 miles per hour, are those from the south and northwest.

Wildlife inhabitants of the millsite are few due to the sparse vegetation on the tailings piles and in the mill area. The only "residents" appear to be rodents, three species of rabbits, and several species of birds. None of the wildlife inhabitants or vegetative species are considered to be threatened or endangered. Occasionally, transient big game animals, such as mule deer, or predators, such as coyotes, have been found on the site. The entire length of Montezuma Creek through the site (17.8 acres) has been designated as wetlands by the U.S. Army Corps of Engineers. Archaeological finds are scattered over several peripheral properties. Several significant finds exist in Montezuma Creek canyon.

## 2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

### 2.1 SITE HISTORY

In late 1940, the Vanadium Corporation of America opened a vanadium ore-buying station at Monticello to stimulate vanadium mining in the region. Within a year, ore production in the area had increased sufficiently to justify construction of a vanadium mill. The mill was constructed by the Vanadium Corporation of America in 1942 with funds from the Defense Plant Corporation. Initially, only vanadium was produced, but from 1943 to 1944 a uranium-vanadium sludge was produced by the Vanadium Corporation of America for the Manhattan Engineer District. The Atomic Energy Commission bought the site in 1948. Uranium milling commenced 15 September 1949 and continued until January 1960, when the mill was permanently closed. Part of the land was transferred to the Bureau of Land Management; the remaining parts of the site have remained under the control of the Atomic Energy Commission and its successor agencies, the U.S. Energy Research and Development Administration and the U.S. Department of Energy.

Numerous milling processes were used at the Monticello millsite during its tenure of operation. These processes included raw ore carbonate leach, low-temperature roast/hot carbonate leach, and salt roast/hot carbonate leach up to 1955; acid leach resin-in-pulp and raw ore carbonate leach from 1955 to 1958; and a carbonate pressure leach resin-in-pulp process from August 1958 to mill closure in 1960.

In the summer of 1961, the Atomic Energy Commission began to regrade, stabilize, and vegetate the piles. This work was initiated on the East Tailings Pile. Tailings sand was hauled from the other three piles and spread over the surface. After the grading was completed, fill dirt and rock were spread over the tops and sides of the piles. The plant was dismantled and excessed by the end of 1964. During the summer of 1965, 6 to 12 inches of topsoil were removed from the ore-storage areas. Photographs suggest that the contaminated soil was used as fill material to partially bury the mill foundations.

In 1972, the Atomic Energy Commission requested additional radiation surveys of the south stockpile area and the ore-buying station. Recommendations were made to remove nearly 15,000 cubic yards of contaminated soil from these areas. Ore-contaminated soil scraped from the ore-storage areas was dumped on the previously stabilized surface of the East Tailings Pile.

The Department of Energy, under the authority of the Atomic Energy Act, initiated the Surplus Facilities Management Program in 1978 to ensure safe caretaking and decommissioning of government facilities that had been retired from service but still contained radioactive contamination. In 1980, the millsite was accepted into the Surplus Facilities Management Program and the Monticello Remedial Action Project was established. The intent of the project is to remediate the government-owned millsite, to dispose of or contain the tailings in an environmentally safe manner, and to perform remedial actions on off-site (vicinity) properties that had been contaminated by radioactive material from the mill operations.

In 1983, remedial activities for vicinity properties were separated from the Monticello Remedial Action Project with the establishment of the Monticello Vicinity Properties Project. The Monticello Vicinity Properties Project was listed on the National Priorities List in 1986 and is being remediated pursuant to a Record of Decision dated 29 September 1989. Both the Monticello Remedial Action Project (Monticello Mill Tailings Site) and the Monticello Vicinity Properties Project are currently administered by the Grand Junction Projects Office of the U.S. Department of Energy.

## 2.2 ENFORCEMENT ACTIVITIES

A Federal Facility Section 120 Agreement with the U.S. Environmental Protection Agency and the State of Utah, pursuant to the Superfund Amendments and Reauthorization Act of 1986, became effective on 24 February 1989. A Hazard Ranking System score for the millsite was developed that led to the inclusion of the Monticello Mill Tailings Site on the Environmental Protection Agency's National Priorities List on 16 November 1989.

The Department of Energy, the U.S. Environmental Protection Agency, and the State of Utah have agreed to perform the response action(s) at the millsite in accordance with the 1989 Federal Facility Agreement. As stated in the Agreement, the Department of Energy is a responsible party with respect to present and past releases at the millsite. Responsibility for oversight of activities performed under the Federal Facility Agreement will be shared by the Environmental Protection Agency and the State, with the former being the lead agency having ultimate responsibility and authority. The State of Utah will participate in planning, selection, and implementation of the remedial action.

In February 1990, the Department of Energy completed the Remedial Investigation/Feasibility Study-Environmental Assessment (DOE/EA-0424) for the millsite. The remedial investigation/feasibility study was supplemented to include analyses sufficient to enable the Department of Energy to assess the impacts of the remedial action alternatives considered in terms of the requirements of the National Environmental Policy Act.

## 3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The remedial investigation/feasibility study and the proposed plan for the Monticello Mill Tailings Site were made available to the public for comment on 27 October 1989. A public comment period on the documents was held from 27 October 1989 to 25 November 1989. This comment period was extended through 19 December 1989 to accommodate additional comments. A public meeting was held on 16 November 1989. Responses to comments received are included in the Responsiveness Summary (Appendix A).

This decision document presents the selected remedial action for two of the three operable units at the Monticello Mill Tailings Site in Monticello, Utah, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act, and the National Contingency Plan. The decision for remediation of this site is based on the administrative record. This document addresses the millsite (Operable Unit I) and the peripheral properties (Operable Unit II).

#### 4.0 SCOPE AND ROLE OF OPERABLE UNITS WITHIN SITE STRATEGY

The Department of Energy, with concurrence from the Environmental Protection Agency and the State of Utah, organized the remedial work into three operable units. These are:

- Operable Unit I: Mill Tailings and Millsite Property
- Operable Unit II: Peripheral Properties
- Operable Unit III: Ground Water and Surface Water

The remedial actions planned for these operable units are interdependent. This Record of Decision addresses the remedial actions for Operable Units I and II. Following the initiation of remedial action for Operable Units I and II and collection of additional surface- and ground-water monitoring data, a Record of Decision will be prepared for Operable Unit III.

Operable Unit I addresses the tailings, ore, and milling by-product materials. This Operable Unit also includes contaminated buildings and equipment, and contaminated soils at the millsite. The principal threats to public health from the tailings and associated materials are exposure to radon gas and gamma radiation. Nonradiological risks have been shown to be minor in comparison to the radiologic risk. Additional environmental threats include surface-water contamination of Montezuma Creek and radiological contamination found in the alluvial aquifer due to tailings in contact with that aquifer. The remediation of Operable Unit I will reduce health threats from tailings and associated material to acceptable levels, and will reduce the potential for further contamination by removing and containing the contamination source.

Operable Unit II addresses the properties peripheral to the millsite contaminated by wind-blown tailings particulate matter, tailings migration via surface water, and residual radioactive material at ore-buying stations. Nine separate land types have been identified, including the Monticello Cemetery, pasture land, hillsides, creek-bottom areas, and Montezuma Creek. Remedial action activities may show that the areal extent of peripheral properties differs from the current estimated acreage. The principal threats to the public from peripheral properties are exposure to gamma radiation and radon gas. The contaminated soil of peripheral properties generally exhibits lower levels of contamination when compared to the mill tailings. The remedial response to Operable Unit II would remove and/or control the source of these health threats.

During the remedial action of Operable Units I and II, the characteristics of Operable Unit III (ground water and surface water) will necessarily be altered. Source removal will cause three changes to the alluvial aquifer: (1) The diversion of surface water will cause unknown effects in the geochemical attenuation of soils below the site; (2) Dewatering of tailings during excavation activities and relocation to the repository may result in removing a large amount of water from the alluvial aquifer. This water will be treated in accordance with the Clean Water Act, Utah Pollution Discharge Elimination System, and other applicable regulations; and (3) Contaminated pore-water retained in the contaminated soils will also be removed, treated to acceptable standards, and released. Removal of contaminated sediments in Montezuma Creek will affect the contamination levels in the creek. Since the

results of these changes will have an unknown effect. a monitoring program for the alluvial and Burro Canyon aquifers and Montezuma Creek will be conducted during remediation of Operable Units I and II. This monitoring program will continue for three years following removal of the contaminated material. Upon collection of adequate data to support selection of a remedial action and the completion of a Remedial Investigation/Feasibility Study. a Record of Decision will then be prepared for Operable Unit III.

## 5.0 SUMMARY OF SITE CHARACTERISTICS

### 5.1 MILL TAILINGS

The uranium mill tailings characterization included sampling for radium-226 and uranium to describe the uranium-238 decay series. A number of elements are generally present in uranium mill tailings in concentrations above background. This characteristic is due to their elevated levels in uranium ores as well as being concentrated as a consequence of milling operations. Nonradioactive elements sampled for in the tailings characterization were antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.

The tailings generated by the millsite operations are contained in four piles referred to, in order of their construction, as the Carbonate Pile, Vanadium Pile, Acid Pile, and the East Pile. The Carbonate and Vanadium Piles were constructed when the mill was recovering vanadium as a by-product using a salt roast/carbonate leach flow sheet. The Acid Pile received tailings from the acid leach Resin-in-Pulp process and a carbonate leach circuit. The East Pile received tailings from the acid leach circuit and the high-temperature, carbonate leach Resin-in-Pulp circuit.

Results of the mill tailings characterization indicate that arsenic, cadmium, chromium, copper, lead, molybdenum, radium-226, uranium, vanadium, and zinc are enriched in the tailings due to the milling process. The Carbonate and Vanadium Piles are distinctly high in vanadium and contrast sharply in this respect with the East and Acid Piles. Beryllium, copper, molybdenum, nickel, and selenium are found in higher concentrations in the East and Acid Piles.

### 5.2 SOIL

Surface soil on the millsite and the peripheral properties has been contaminated by tailings and ore residue from mill operations through the storage of ore in open stockpiles, the emissions from the roaster stack, the overflow of tailings ponds, and the erosion of tailings piles by wind and water. The dispersal of tailings and ore residues has contaminated soil with both radioactive and nonradioactive elements. Areas are considered contaminated if the radium-226 concentration in soils exceeds the Environmental Protection Agency standard (40 CFR 192.12) of 5 pCi/g above background in the top 15 cm of soil or 15 pCi/g above background in any 15 cm layer below the top 15 cm. A summary of millsite contamination as compared to the standards is presented in Table 5-1.

The contamination of surface soil by these radioactive and nonradioactive elements was portrayed by mapping the distribution of radium-226. The use of radium as a proxy for other metals contained in the ore and tailings is justified because the other elements, excluding uranium and vanadium, passed through the mill circuit with radium to the tailings piles where they reside in concentrations approximating those found in ore. Further, no transport mechanism has been identified that would account for the segregation and dispersal of one of the non-ore elements independently of others.

Details of the radium mapping and sampling activities are found in the remedial investigation report. Analytical results on soil samples, together with results of in-situ spectrometer measurements, indicate an average background radium-226 concentration of  $1.0 \pm 0.4$  picocuries per gram (pCi/g) for surface and subsurface soils.

Table 5-1. Average Radium-226 Concentrations in Tailings Piles and Millsite Soil, as Compared to Clean-Up Standards

Location	Average Radium-226 Concentration	Standard <sup>1</sup> (pCi/g)
Carbonate Pile	Approximately 870 pCi/g	5/15
Vanadium Pile	Approximately 460 pCi/g	5/15
Acid Pile	Approximately 750 pCi/g	5/15
East Pile	Approximately 590 pCi/g	5/15
Surface Soil (Millsite)	20 pCi/g	5
Subsurface (Millsite)	N/A <sup>2</sup>	15
Background	$1.0 \pm 0.4$ pCi/g	

<sup>1</sup>40 CFR 192.12. land clean-up standards are given as pCi/g above background. "5" indicates 5 pCi/g averaged over the first 15 cm of soil below the surface; "15" indicates 15 pCi/g averaged over 15 cm thick layers of soil more than 15 cm below the surface.

<sup>2</sup>An average radium-226 concentration for all subsurface soil areas on the millsite was not calculated. Radium-226 concentrations in subsurface soil for off-pile areas generally do not exceed the standard below 6.5 ft. Soil and alluvium beneath the tailings piles may exceed the standard as deep as 18 ft., generally.

### 5.2.1 Millsite

Most of the surface-soil layer on the millsite contains concentrations of radium-226 exceeding Environmental Protection Agency standards. Contamination of the cover-soil material on the piles is believed to be due largely to the redistribution of tailings by burrowing animals. Some surface-soil contamination on the East Pile was caused by the disposal of contaminated soil during the 1974 to 1975 peripheral properties clean-up activities.

The average concentration of radium-226 in the surface-soil layer is 20 pCi/g for the millsite. The total radium-226 activity of the surface layer (0-15 cm) is estimated to be 4 to 5 curies.

Radiometric logs of borings drilled on the millsite indicate apparent radium-226 contamination of subsurface materials. In off-pile areas, contaminated soil exceeding the Environmental Protection Agency subsurface criterion of 15 pCi/g above background extends no deeper than about 4 to 6.5 feet and some areas show no subsurface radium contamination. Environmental Protection Agency standards may be exceeded as deep as 15 to 18 feet in the soil and alluvium beneath the tailings piles. In areas where contaminated building material and by-product material may be buried, standards are also expected to be exceeded.

### 5.2.2 Peripheral Properties

Radiologically contaminated areas adjacent to the millsite include two former ore-storage areas, the weigh station, the buying station, mill buildings, three residences, and farming properties, totaling approximately 300 acres. Approximately 200 acres are affected by radium-226 levels that exceed Environmental Protection Agency standards at 40 CFR 192.12. It is probable that former ore storage areas and other properties have buried by-product material or contaminated building and equipment material that may cause elevated concentrations of radioactive constituents. Windblown and waterborne radium-226 contamination extends to the north and east into residential and farming properties.

The weighted average depth of radium-226 contamination is 0.9 feet; the range is from 0.5 foot to greater than 6 feet. Radium-226 at a concentration greater than 500 pCi/g was found in an ore-stockpile area south of Montezuma Creek and west of the Acid Pile. Radium concentrations above the Environmental Protection Agency standards range from 6 pCi/g to 7185 pCi/g.

### 5.3 AIR

Two types of substances with the potential to adversely affect air quality have been identified at the site: radon-222, a radioactive gas produced by the natural decay of radium-226, and airborne radioactive and nonradioactive particles associated with the tailings. Environmental monitoring programs were established both on and off the millsite in 1983 to evaluate the radon levels and to measure select elements in the total suspended particulate burden. The following subsections summarize the contaminant concentrations found and identify the applicable regulatory standards associated with each contaminant. Details of the sampling methodology and results appear in the remedial investigation report.

#### 5.3.1 Atmospheric Radon

The Environmental Protection Agency standard (40 CFR Part 192) for atmospheric radon gas concentration at the edge of an inactive uranium mill tailings pile is 0.50 picocurie per liter (pCi/L) above background. Therefore, the site-specific standard is calculated to be 0.91 pCi/L, using 0.41 pCi/L as the average annual background for Monticello (inferred by examining results from and at every edge-of-pile location). The only off-site location where contamination exceeds the standard is a single sampling station located approximately 1,700 feet east of the millsite boundary. The contamination results from the wind-blown materials. Radon gas concentrations were found to be the same as background at a sample site located 1100 feet northwest of the Department of Energy property boundary.

An atmospheric transport model was used to estimate the atmospheric dispersion of radon gas attributable to the millsite. The predicted concentration in excess of background for the entire Monticello area is 0.06 pCi/L.

#### 5.3.2 Radon Gas Emissions

On-site measurements indicate that the Environmental Protection Agency standard (40 CFR 192) for radon emissions at inactive uranium mill processing sites (20 picocuries per square meter-second [ $\text{pCi} \cdot \text{m}^{-2} \cdot \text{sec}^{-1}$ ]) is exceeded at each of the four tailings piles. The weighted-average radon emission at the Carbonate Pile was highest at  $765 \text{ pCi} \cdot \text{m}^{-2} \cdot \text{sec}^{-1}$ .

Off-site measurements show elevated radon gas concentrations in an area extending southeast from the millsite property boundary to within 150 feet of the sampling station located approximately 1,700 feet east of the property boundary. It is suspected that tailings were physically transported from the millsite and deposited on a narrow alluvial floodplain in this area. This source is estimated to cover  $29,766$  square meters. The maximum radon emission in the area is  $65 \pm 3 \text{ pCi} \cdot \text{m}^2 \cdot \text{sec}^{-1}$ .

### 5.3.3 Air-Particulate Levels

Continual air particulate monitoring was initiated at the Monticello site in August 1983. Sampling stations at the site were located along the paths of the prevailing wind directions, to the north and to the east (as determined by windrose data). In addition, a background station was established west of the site.

No Department of Energy limits for radioactive particulates (the limits above background as stated in DOE Order 5480.1 are  $3.0 \text{ } \mu\text{Ci}/\text{m}^3$  for radium-226 and  $9 \text{ } \mu\text{g}/\text{m}^3$  for uranium-238) were exceeded, according to measurements taken both on and off site. The results of sampling were also compared to background measurements taken at other rural areas in the western United States. The levels found at the Monticello millsite were several orders of magnitude lower than those at other locations. The average air particulate radium-226 and uranium-238 concentrations at the millsite were  $0.0006 \text{ pCi}/\text{m}^3$  radium-226 and  $<0.0012 \text{ } \mu\text{g}/\text{m}^3$  uranium, respectively.

## 5.4 MONTEZUMA CREEK

### 5.4.1 Stream Sediments

Several studies were performed following mill closure to assess the levels of radium-226 in sediments of Montezuma Creek downstream from the Monticello millsite. Data from these early studies revealed that high concentrations of radium-226 persisted in the sediments of Montezuma Creek. These high concentrations were probably attributable to bedload transport of sandy tailings material eroded from the piles during mill operations.

Data from a 1987 survey provide a more detailed portrayal of the radium distribution along the creek because samples were collected from stream banks and floodplain soil near the creek as well as from the channel itself. Substantial radium contamination exists in and adjacent to Montezuma Creek to a point about 1,600 feet east of the millsite. Downstream from this point, concentrations of 1 to 60 pCi/g are typical, although concentrations of 100 pCi/g and higher occur sporadically. Sediments are considered contaminated when the concentration of radium-226 exceeds the 40 CFR 192.12 standard of 5 pCi/g above background in the top 15 cm of sediment or 15 pCi/g above background in any 15 cm layer below the top 15 cm.

### 5.4.2 Surface Water

A summary of the current surface water contamination is presented here so that the extent of contamination due to the millsite may be better understood. The existing surface water characterization also provides a baseline for further characterization to be performed following millsite remediation, under Operable Unit III.

Background surface-water quality has been monitored for some years at a point on Montezuma Creek east of the culvert under Highway 191, upstream from the millsite. The water has been characterized as having low or nondetectable levels of heavy metals or mill-tailings-related material.

Montezuma Creek flows through the middle of the millsite. Flow is perennial, although it can be quite low during the late summer. Data obtained from a September 1981 intensive sampling of the creek indicate that uranium concentrations in the creek begin to increase (0.29 mg/l uranium) upstream from the point at which the creek traverses the actual tailings piles. Uranium levels in the creek increase by an additional 40 to 50 percent toward the downstream boundary of the millsite. Concentrations of arsenic, molybdenum, vanadium, and uranium increase downstream from the entrance of a seep (located between the Carbonate and Vanadium Piles) into the creek. On the downstream side of the Vanadium Pile, concentrations of uranium, molybdenum, selenium, vanadium, and radium continue to increase.

Seeps issuing from an alluvial aquifer increase the concentration of uranium in the creek by as much as an order of magnitude in the first 160 to 330 feet downstream from the millsite. Samples collected 1/2 mile downstream from the millsite show an average concentration of 0.183 mg/l uranium. In addition, four miles downstream from the millsite, the Salt Wash Member of the Morrison Formation contributes measurable amounts of uranium to Montezuma Creek. This contribution is responsible, in part, for maintaining the high uranium concentrations (as high as 0.22 mg/l) observed at the Montezuma Canyon sampling location, 6 miles below the millsite.

Other mill tailings constituents have been sampled for in Montezuma Creek and compared with Federal water-quality standards and State of Utah water-quality standards. Samples were collected east of the tailing site downstream from the aquifer recharge area. The comparison of the surface-water sampling data to State and Federal water-quality standards indicates that gross alpha-particle activity, arsenic, molybdenum, manganese, selenium, zinc and pH exceed recommended concentration levels. The potential for exposure to these elements suggests that this water should not be used for drinking by humans or cattle and that remedial action should be taken to improve surface-water quality.

## 5.5 GROUND WATER

A summary of the alluvial aquifer contamination is presented here so that the extent of contamination from the millsite is better understood. The existing ground-water characterization also provides a baseline for further characterization of the ground water, which will occur during and following remediation of the millsite and peripheral properties. A Record of Decision will be prepared when sufficient data have been gathered to warrant a final decision for restoration of the alluvial aquifer.

Analytical data from samples obtained from seven on-site wells drilled into the alluvial aquifer and sampled for nonradioactive elements associated with mill tailings (these elements are identified in Section 5.1), and for uranium, radium, and vanadium, show considerably elevated concentrations in comparison with the upgradient wells. In general, the highest concentrations are associated directly with the tailings area. Many of the highest concentrations of nonradioactive and radioactive elements are from wells drilled in the vicinity of the Carbonate and Vanadium Piles and from a well located near the east edge of the millsite property.

Wells located downgradient from the millsite typically have nonradioactive and radioactive element concentrations that are elevated in comparison with upgradient wells. For example, the maximum arsenic concentration found in upgradient wells is 0.01 mg/L and the maximum downgradient is 0.02 mg/L for the period 1984-1986. For uranium, the maximum upgradient well concentration for the same period is 0.019 mg/L and the maximum downgradient is 0.8 mg/L. The southward extent of offsite alluvial aquifer contamination is limited by Montezuma Creek, where the creek enters Montezuma Canyon.

Ground-water samples collected from wells located downgradient from the millsite and completed in the Burro Canyon Formation are similar to those observed in the upgradient well in the alluvial aquifer, suggesting that the Burro Canyon aquifer is not affected by the contaminated alluvial aquifer. Elevated levels of nonradioactive and radioactive elements found downgradient in the alluvial aquifer are not found in the Burro Canyon aquifer. Current data show the average uranium concentration for three downgradient wells in the alluvial aquifer is 0.41 mg/L, whereas the average uranium content of downgradient wells in the Burro Canyon aquifer is approximately 0.002 mg/L.

## 6.0 SUMMARY OF SITE RISKS

A baseline risk assessment was conducted to evaluate the public health and environmental risks resulting from the existing contamination at the millsite. The risk resulting from ground-water and surface-water contamination will be addressed in detail after remediation of the millsite and peripheral properties begins. Actual or threatened releases of hazardous substances from this site, if not addressed by the preferred alternative or one of the other active measures considered, may present an imminent and substantial endangerment to public health, welfare, or the environment. The following risk summary explains why this endangerment exists. Information included in this summary has been excerpted from Chapter 8 of the remedial investigation report where details of the assessment can be found.

The radiologic health threat is attributed predominantly to uranium and radium-226. Uranium is a health concern as well due to its toxicity. Of the nonradiologic elements, arsenic is a proven carcinogen. The other elements are potential health concerns depending upon the concentration and type of exposure.

Dispersion of uranium mill tailings from the millsite occurs through natural and man-caused actions. Wind- and surface-water dispersion have caused the spread of tailings to peripheral properties, while use of the tailings as construction material has distributed the tailings to local residential and commercial properties. Dispersion to numerous residences and businesses in the City of Monticello has resulted in the identification and remediation of the Monticello Vicinity Properties. This site was included on the National Priorities List in 1986.

### 6.1 HUMAN HEALTH RISKS

#### 6.1.1 Radioactive Contaminants

The two major contaminants of concern for the radiological public health assessment are radon gas and gamma radiation, both of which are attributable to the tailings piles and the contaminated soils and materials on the millsite and peripheral properties. Radon gas migrates through the tailings into the atmosphere. Gamma radiation is emitted from the tailings. The adverse health effects of radon emanation arise from inhalation of the short-lived radon daughter products which can expose the lungs to their full radiation dose. Gamma radiation delivers its dose to the entire body.

Five potential exposure pathways were identified:

- ingestion of contaminated food produced in areas contaminated by the tailings;
- inhalation and ingestion of airborne radioactive particulates;
- ingestion of surface water contaminated by the tailings;

- inhalation of radon and radon daughters: and
- direct exposure to gamma radiation emitted from the tailings.

The first two pathways, which include ingestion of plant material "dusted" with windblown tailings, ingestion of animal food products from animals ingesting such plant material, inhalation and ingestion of airborne particulates, and ingestion of household dust, are considered insignificant because concentrations of uranium and radium associated with airborne particulates are below background levels. The third pathway is not considered to be a probable pathway because elevated radium concentrations have not been detected in Montezuma Creek. Elevated uranium levels have been detected in off-site wells and Montezuma Creek, however, uranium is being considered under nonradiological risks for the following reasons. First, the radiological exposure dose rate from uranium is low because of its low concentration in the water. Secondly, uranium is a strong nephrotoxin and because it has a very long half-life will persist in the environment. Therefore, two pathways remained for consideration: inhalation of radon and radon daughters, and direct exposure to gamma radiation.

For each of these two pathways, the excess cancer incidence to the Monticello population was determined by multiplying the population dose commitment by a factor representing the estimated cancer risk per rem of exposure. Rem (Roentgen Equivalent Man) is a unit used to measure exposure to radiation which applies qualitative and other modifying factors to account for the particular character of the radiation exposure. Population dose commitment was determined by multiplying the average annual individual rate of exposure by the total population; it is expressed in units of person-rem per year (person-rem/yr). For radon, an individual lung cancer risk factor of  $20 \times 10^{-6}$  per rem, or 20 excess cancer deaths per year per 1 million person-rem, was used. For gamma radiation, a risk factor of  $120 \times 10^{-6}$  per rem was used. This factor is equivalent to 120 excess cancer deaths in an exposed population for each 1 million person-rem of collective dose equivalent.

For the scenario representing inhalation of radon from the millsite and peripheral properties, the excess annual cancer incidences to the Monticello population are estimated to be  $0.38 \times 10^{-2}$  (or, 0.0038 excess cancer incidences for the Monticello population). Whole body exposure to gamma radiation resulted in an estimated excess cancer incidence of  $2.0 \times 10^{-2}$  per year, or 0.02 excess cancer incidences for the entire Monticello population annually. The radiological risk assessment was performed on a population basis prior to recent EPA guidance on performing radiological risk assessments on an individual basis.

As an indicator of potential individual risk due to baseline radiological conditions, a gross estimate of the lifetime excess cancer incidence to the individual was estimated to be  $1 \times 10^{-5}$ . Although this rough estimate is within the Environmental Protection Agency's acceptable risk range ( $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ ) the millsite will still be remediated to comply with the pertinent health-based applicable or relevant and appropriate requirements in 40 CFR 192 which requires remediation of uranium mill tailings to specific levels regardless of risk.

#### 6.1.2 Nonradioactive Contaminants

A preliminary screening was conducted to identify the "highest risk", or indicator, elements found on the site. Excluded from consideration as indicator elements were those elements found in upgradient surface-water at equal or higher concentrations than those appearing on the site. Those elements found in soil and air particulates at concentrations not exceeding background levels were also excluded. The following elements were selected as

nonradiologic "indicator" elements: arsenic, copper, lead, molybdenum, selenium, uranium, vanadium, and zinc. With the exception of molybdenum, all of the elements characterized in the tailings piles are listed as Comprehensive Environmental Response, Compensation, and Liability Act hazardous substances at 40 CFR 302.4.

Under existing conditions, the major sources of nonradiologic elements are the tailings piles and mill process-related by-product material at the millsite. Nonradiological constituents in the tailings piles can be leached from the tailings and released into other environmental media. Contaminants may be transported or released from the tailings pile into the ground water, surface water, and air. Toxic elements are leached from the tailings into the shallow alluvial aquifer.

Potential exposure pathways were developed based on the populations and activity patterns in the vicinity of the uranium mill tailings site. These pathways are:

- inhalation of resuspended dust;
- ingestion of contaminated soil;
- ingestion of contaminated vegetables; and
- ingestion of contaminated beef.

The first pathway, inhalation of resuspended dust, was excluded from further consideration because monitored particulate concentrations indicated that the levels were not elevated above background. Further, several nonradiologic elements were analyzed for in the particulate samples obtained. Lead is the only nonradioactive airborne particulate measured at the millsite that is regulated by a specific standard. Acceptable airborne levels of this element are defined by the Environmental Protection Agency under the National Ambient Air Quality Standards. The standard specifies that a 3-month average concentration of lead is not to exceed  $1.5 \mu\text{g}/\text{m}^3$ . The maximum concentration measured at the site is  $0.0490 \mu\text{g}/\text{m}^3$ , well below the compliance standard.

The second pathway, ingestion of contaminated soil, was also excluded from the assessment because although limited entry may occur at the millsite, the frequency is very low due to existing fences. The chance that a trespasser would ingest contaminated soil is low because ingestion is associated predominantly with very small children. Further, the existing soil cover serves as an additional barrier to ingestion of the tailings material, which contains the greatest concentration of nonradiological constituents.

The potential future risk for the soil ingestion pathway has been qualitatively estimated, although the potential for the access controls currently used by the Department of Energy to be removed in the future is extremely low. The Department of Energy has strict requirements for controlling radioactively contaminated sites, which do not allow sites to be released for unrestricted use unless radiation levels are within acceptable limits. It is highly unlikely that the Department of Energy, or other successor Federal agency, would loosen this policy for a contaminated site. However, under a future risk scenario, it is anticipated that risks to the exposed population will be minimal because of a low exposure frequency due to the area's sparse population. Also, the exposure dose will be low (under 60 mg/day) because only older, unsupervised children are likely to enter this area. Therefore, assuming it is possible to enter the site under a future scenario, risks associated with nonradioactive contaminants through the soil ingestion pathway should be negligible.

Pathways (3) and (4) were retained for consideration. They are considered to be indirect exposure routes resulting from contaminated surface water in the area, used to irrigate fields and water livestock. Contaminants in the water can enter the food chain through the ingestion of contaminated vegetables and beef.

Noncarcinogenic health effects can arise from acute and chronic exposures to all eight elements. Reference doses have been developed by the Environmental Protection Agency to indicate the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects (e.g., persistent neurological effects, neurotoxicity, respiratory problems, skin rashes). A reference dose is an estimate of a lifetime daily exposure level (specific to a particular exposure route) for humans, including sensitive individuals, which is unlikely to result in an appreciable risk of deleterious (adverse) effects during a lifetime.<sup>a</sup> Estimated intakes of chemicals from environmental media (e.g. the amount of a chemical ingested from contaminated drinking water) can be compared to the reference dose (or acceptable intake for chronic exposure). Both parameters are expressed in units of milligram per kilogram-day (mg/kg·day).

Intake estimates of each indicator element were computed for the potential exposure pathways for both children and adults. Maximum and average soil concentrations were used in exposure dose calculations. Total oral intake for the contaminated vegetable and contaminated beef pathways were then compared with the acceptable intakes for chronic exposure.

Exposures were then calculated for the two exposure scenarios retained for consideration. Comparison of existing contaminant concentrations with the acceptable intakes for chronic exposure resulted in no apparent health risk. When average concentrations of contaminants in soil were used, none of the dose levels were exceeded. Copper, uranium (including the vegetable pathway) and zinc (including or excluding the vegetable pathway) exceeded recommended levels for children when maximum soil concentrations were used. However, because the millsite is uninhabited, and considering historical land use patterns in the area, it is unlikely that individuals would receive chronic exposure to these maximum concentrations. Because average exposure doses do not exceed the acceptable intakes for chronic exposure, use of surface water to irrigate pasture or alfalfa, on which cattle graze, appears to be acceptable.

Arsenic is the only indicator chemical that is considered to be a human carcinogen. According to the Environmental Protection Agency weight-of-evidence classification system for carcinogenicity, arsenic is included in Group A, meaning it is a confirmed human carcinogen. The slope factors (analogous to cancer risk factors for radiologic contaminants) for arsenic for the inhalation and ingestion exposure pathways are  $50 \text{ (mg/kg·day)}^{-1}$  and  $1.5 \text{ (mg/kg·day)}^{-1}$ , respectively.

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<sup>a</sup>The original risk assessment used "acceptable intakes for chronic exposure" instead of reference doses. Acceptable intakes for chronic exposure and reference doses are similar in concept, but reference doses are derived using a more strictly defined methodology. Acceptable intakes for chronic exposure were recommended by the Environmental Protection Agency when the original risk assessment was prepared, but the Environmental Protection Agency now recommends the use of reference doses. Therefore, this terminology has been used in this discussion.

Excess lifetime cancer risks due to exposure from arsenic levels at the millsite, for pathways 3 and 4, were determined by multiplying the intake level by the slope factor. Calculated cancer risks from arsenic contamination are within the health goal range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$  lifetime cancer risk. This range has a point of departure at  $1 \times 10^{-6}$ . An excess lifetime cancer risk of  $1 \times 10^{-6}$  indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the attributable to the millsite for an individual due to ingestion of contaminated vegetables is  $2.7 \times 10^{-5}$ , or 2.7 cancers in 100,000 people exposed, using maximum soil concentrations; and  $7.0 \times 10^{-6}$  (or 7 cancers in 1,000,000 people exposed) for average soil concentrations above background. Cancer risks for arsenic attributable to the millsite for an individual due to ingestion of contaminated beef is  $2.0 \times 10^{-5}$  (or 2 cancers per 100,000 people exposed) using maximum soil concentrations and  $2.0 \times 10^{-6}$  (or 2 cancers per 1,000,000 people exposed) using average soil concentrations above background. On the basis of this information, arsenic may pose a public health impact under the existing conditions at the millsite.

## 6.2 ENVIRONMENTAL RISKS

Risks to the natural environment that were considered in the remedial investigation/feasibility study are also addressed in this Record of Decision. Specific environmental concerns at the millsite and on peripheral properties include impacts to archaeology, vegetation, wildlife, fisheries, and floodplain/wetlands.

An inventory of the lower Montezuma Creek drainage identified one historic site on the floodplain and numerous prehistoric sites along the walls of the canyon. The historic site was field-evaluated as nonsignificant. Several of the prehistoric sites were field-evaluated as significant because they are likely to possess undisturbed stratified cultural deposits; determinations of these sites' eligibility for the National Register of Historic Places must be made prior to their disturbance, and will be dealt with under Operable Unit III.

Threatened or endangered plant species were not encountered during the remedial investigation, although the area is within the potential range of two species of cacti, one of which is listed as threatened and one of which is listed as endangered by the U.S. Fish and Wildlife Service. No plants of State concern were found in the area.

According to the U.S. Fish and Wildlife Service, no threatened or endangered avian species occur at or near the Monticello millsite, although the endangered American peregrine falcon and the threatened bald eagle could occur in the area. Use of the millsite by either species is considered remote because of the lack of arboreal vegetation.

Fishery species of concern which occur in the San Juan River approximately 30 miles south of the millsite include the Colorado squawfish, the razorback sucker, and the roundtail chub. In the upper reaches of Montezuma Creek where sampling occurred, no fish were found. The principal reason for this is thought to be the seasonal dewatering of the creek, especially prior to 1986. Present stream conditions in the lower creek indicate deep pools with cover that could support a fishery.

The U.S. Army Corps of Engineers performed a wetlands assessment in August 1989. It was determined that Montezuma Creek and adjacent wetlands areas constitute 18.63 acres of wetlands, beginning at Highway 191 and ending at the creek's confluence with Vega Creek.

## 7.0 DESCRIPTION OF ALTERNATIVES

Remedial action alternatives in the feasibility study report were evaluated in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act, and the National Contingency Plan. Prior to evaluating remedial action alternatives, several preliminary evaluations occurred. Remedial action objectives were identified on the basis of the millsite characterization results. Response actions and associated technologies were considered and screened for each operable unit. The technology screening activities were based on relative effectiveness, implementability, and cost. Preliminary remedial action alternatives were then developed from the remaining technology process options. The concept of operable units was utilized to differentiate contaminated media and to provide a mechanism for developing and evaluating alternatives for each media. Alternatives were developed ranging from those eliminating the need for long-term management, to alternatives involving treatment that would permanently reduce the mobility, toxicity, or volume of the hazardous substances as their principal element. Containment options were also developed.

During the preliminary remedial action alternatives analysis, several potential options were dropped. Chemical/physical treatment of the tailings was eliminated due to high cost (i.e., lime stabilization) for treatment of all constituents, and poor implementability because of unproven technologies (i.e., in-situ vitrification). Disposing of the tailings in a repository built at the tailings piles' current location was eliminated due to the inability to meet relevant and appropriate requirements, specifically 40 CFR 192, which places severe limits on disposal sites placed in contact with ground water. The tailings would have to be removed, a liner installed, and the tailings replaced. Cost, decontamination difficulties, and questions on longevity and liner effectiveness made this option ineffective, less protective of human health and the environment, and difficult to implement.

Seven potential off-site repository locations within 12 to 45 miles of the site were also evaluated during the preliminary screening process for effectiveness, implementability, and cost. Siting criteria were established based on 40 CFR 192 and each potential site was evaluated against these criteria.

Based on the screening process, the Highway 95 site was selected as the most suitable of these sites and was kept for further evaluation in the feasibility study. This location was ultimately eliminated during the detailed analysis of alternatives because of implementability and cost. The site was very similar in most respects to the "existing off-site repository" alternative (which was retained as a remedial action alternative) except that the Highway 95 site consisted of undisturbed land. The potential for impact to environmental and historical resources, and other pertinent requirements would make this alternative more difficult to implement than removal to an existing off-site repository. The lack of existing improvements on the Highway 95 site also led to increased costs. The other six sites exhibited substantially higher potentials for wind and water erosion, flooding, and landslides than did the sites retained for detailed analysis. Other problems exhibited by the eliminated sites include ground-water concerns, endangered species considerations, and the ability to meet design longevity standards for the repository.

### 7.1 OPERABLE UNIT I -- MILL TAILINGS AND MILLSITE PROPERTY

Operable Unit I includes approximately 1.5 million cubic yards of uranium mill tailings, ore, by-product material, contaminated building materials, and mill equipment existing on the millsite.

Three remedial action alternatives were retained for detailed development and analysis for this operable unit. They are no action, removal of tailings and transport to a licensed repository, and removal of tailings with disposal in a repository on site, south of the present location. A discussion of each alternative follows:

#### 7.1.1 Alternative 1: No Action

The no-action alternative provides a baseline with which to compare other alternatives and involves performing no remedial action, while continuing monitoring activities. Institutional controls are likely to be in place due to their current existence and the Department of Energy's philosophy of restricted access for contaminated areas. This alternative would result in continued contamination of the alluvial aquifer and Montezuma Creek. Leaving the tailings in their present condition would subject them to dispersal by water and wind and would continue to prevent beneficial use of contaminated areas. Exposure levels (and therefore, health risks) could increase significantly if land use were to change, or if uncontrolled removal of the wastes were to occur.

#### 7.1.2 Alternative 2: Removal of Tailings and Transport to a Licensed Repository

This alternative involves excavation and removal of contaminated materials to an off-site licensed repository. The disposal cell would meet the current design and operation requirements of the Nuclear Regulatory Commission or relevant State agency. Since remediation of the Monticello site is a Comprehensive Environmental Response, Compensation, and Liability Act action, Environmental Protection Agency design criteria at 40 CFR Part 192 would be relevant and appropriate requirements for the repository.

All tailings, milling process by-product material, and contaminated building and equipment material from the millsite would be relocated to the site by truck transportation on highways.

#### 7.1.3 Alternative 3: Removal of Tailings and Disposal in a Repository On Site, South of the Present Location

This alternative involves excavation and removal of contaminated materials to an on-site repository site located south of the existing millsite. Removal of the tailings, by-product material, and contaminated building and equipment material would prevent future contamination of air, surface soil, and ground water as presented in the previous alternative. Removal would be by conventional earthmoving equipment. Transport of tailings and other materials would be entirely on site. Dust-control measures and access restrictions would be used to protect public health during remedial action activities. To control runoff, diversion structures would be built with collected water treated by evaporation ponds, reverse osmosis, or other appropriate technologies to be determined during the design process. Treated water would be discharged to Montezuma Creek in accordance with the applicable regulations (Clean Water Act, Utah Pollution Discharge Elimination System, and other regulatory requirements), or used for compaction or dust control purposes. Contaminated residuals from either of the treatment systems would be disposed of in the new repository or at a licensed repository. Tailings disposal would occur on land contiguous to the existing millsite in a repository covered with a clay and multimedia cap. This repository would be designed to comply with 40 CFR 192 performance standards. The land is not currently owned by the Department of Energy and would have to be acquired. The Environmental Protection Agency, in accordance with the National Contingency Plan, has determined that the proposed location of the repository meets the criteria for being considered "on site".

## 7.2 OPERABLE UNIT II -- PERIPHERAL PROPERTIES

Operable Unit II includes approximately 300,000 cubic yards of radioactively contaminated soils carried by wind or water from the millsite, and mill processing by-product material located on peripheral properties.

Two remedial action alternatives, retained for detailed development and analysis for this operable unit, are described in the following subsections: no action, and clean up to 40 CFR 192.12 standards, which includes placement of contaminated material in a repository with the millsite tailings. This alternative also allows the opportunity for the Department of Energy to apply for supplemental standards under 40 CFR 192 at specific properties.

### 7.2.1 Alternative 1: No Action

This alternative would leave contaminated peripheral properties alone, with no remediation being performed. In contrast with the no-action alternative for Operable Unit I, institutional controls are not currently in place because properties are not under the Department of Energy's control. The no-action alternative provides a baseline with which to compare the other remedial action alternatives.

### 7.2.2 Alternative 2: Clean Up to 40 CFR 192.12 Standards

Peripheral properties will be cleaned up to the principal relevant and appropriate standard, 40 CFR 192. Contaminated materials will be transported to the existing millsite and will be relocated with the millsite materials to the repository location chosen for Operable Unit I.

Removal of contaminated materials will be either by conventional construction techniques or by environmentally sensitive removal techniques. Conventional construction utilizes large earthmoving equipment to remediate the properties by removing the contaminated soil and materials. Soil removed would be replaced with clean material and the site would be revegetated. Although all means would be attempted to revegetate the area to its present condition, it will take several years to re-establish the native bushes and decades to re-establish the native tree species.

In areas with mature dense vegetation, environmentally sensitive construction techniques, such as hand excavation, could be used successfully to remove the contaminated soils, yet minimize environmental damage to areas that are important wildlife habitats. An option to hand excavation would be the use of high-suction vacuum equipment specifically designed for remediating hazardous waste spills. This equipment has costs similar to hand excavation, but would tend to clean up more precisely the actual areas of contamination. Other environmentally sensitive construction techniques would be considered.

Figure 7-1 shows the peripheral properties currently identified, with the exception of Upper and Lower Montezuma Canyon (designated H-SS and I-SS), which are located further downstream on Montezuma Creek. Remediation of these two properties will be addressed in the Record of Decision for Operable Unit III following remediation of Operable Units I and II. The Environmental Protection Agency and State of Utah have agreed that supplemental standards applications under 40 CFR 192 will be considered for these two properties. Use of supplemental standards may allow no clean up or clean up to a lesser standard than 40 CFR 192.12 if full remediation would cause undue direct environmental damage in comparison to the derived health benefits.

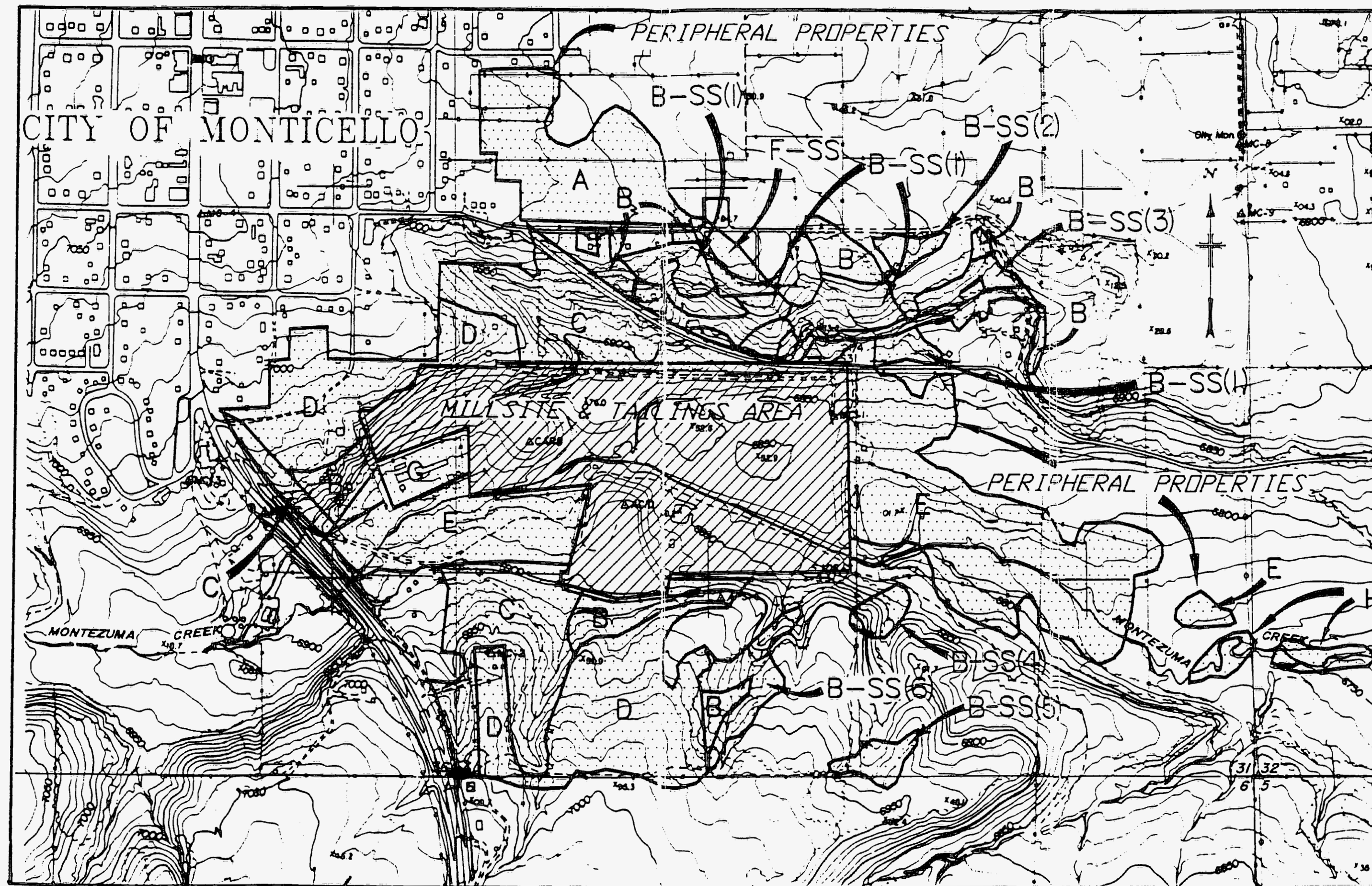


Figure 7-1. Peripheral Properties

The Department of Energy, the Environmental Protection Agency, and the State of Utah have agreed that the densely vegetated hillside properties, designated B-SS, located on the north side of Montezuma Creek will be remediated to the 40 CFR 192.12 standards using conventional or environmentally sensitive construction techniques. These six properties had previously been proposed for supplemental standards application under 40 CFR 192. The Environmental Protection Agency and the State of Utah have agreed to consider applications for the use of supplemental standards on densely vegetated hillside properties on the south side of Montezuma Creek, designated B-SS, and the Monticello cemetery (F-SS). Application submittal and evaluation will occur during remedial design.

## 8.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

The following discussion summarizes the alternatives evaluation identified in the feasibility study. The alternatives were evaluated on the basis of nine key criteria that directly relate to the factors that the Comprehensive Environmental Response, Compensation, and Liability Act mandates for assessment when selecting a remedy. These criteria are:

- (1) Overall protection of human health and the environment.
- (2) Compliance with applicable or relevant and appropriate requirements (detailed in Section 10.0).
- (3) Use of treatment to achieve a reduction in the toxicity, mobility, or volume of the contaminants.
- (4) Long-term effectiveness and permanence in protecting human health and the environment.
- (5) Short-term effectiveness in protecting human health and the environment.
- (6) Implementability.
- (7) Cost.
- (8) State acceptance, and
- (9) Community acceptance.

Criteria 1 and 2 are threshold criteria, relating directly to statutory findings that must ultimately be made in this Record of Decision. These criteria must be met by the chosen remedial action alternatives. Criteria 3, 4, 5, 6, and 7 are considered primary balancing criteria that represent technical, cost, institutional, and risk concerns. The final two criteria are modifying criteria and are used within an alternative to alter activities based on State and local concerns. The comparative analysis of alternatives for Operable Units I and II are summarized in Tables 8-1 and 8-2, respectively.

### 8.1 OPERABLE UNIT I -- MILL TAILINGS AND MILLSITE PROPERTY

#### 8.1.1 Protection of Human Health and the Environment

Alternative 1, no-action, fails to protect human health and the environment because it does not control exposure pathways. Contamination of the alluvial aquifer and Montezuma Creek would continue, and tailings left in their present configuration would remain subject to dispersal by water and wind. Human exposure to radioactive constituents would continue at present levels.

TABLE 8-1. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

## FOR OPERABLE UNIT I, MILL TAILINGS AND MILLSITE PROPERTY

		1. Overall Protection Of Human Health and the Environment	2. Compliance With Applicable or Relevant and Appropriate Requirements	3. Reduction of Toxicity, Mobility, or Volume of Contaminants by Treatment	4. Long-Term Effectiveness and Permanence
ALTERNATIVE					
1.	No Action	Does not meet criterion. Fails to control exposure pathways.	Does not meet criterion. Fails to meet 40 CFR 192 and others.	Does not meet criterion. No treatment is involved.	Does not meet criterion. Fails to control exposure pathways.
2.	Tailings Removal and Transport to a Licensed Repository	Meets criterion. Contamination source is removed. Reduces contaminant mobility by containment in a repository complying with 40 CFR 192.	Meets criterion. Complies with all requirements, including 40 CFR 192.12 clean-up standards; 40 CFR 61, Subpart Q radon emission standards; Utah Water Quality Control Standards; the Utah Occupational Safety and Health Act; State and Federal historic preservation laws; floodplain/wetland policy; and the Farmland Protection Policy Act.	Does not meet criterion.	Meets criterion. Overall reduction of radiologic risk to public is 41% when compared to existing conditions.
3.	Tailings Removal and Disposal in a Repository On Site, South of Present Location	Meets criterion. Removes contamination source. Reduces contaminant mobility by containment in a repository complying with 40 CFR 192.	Meets criterion. Complies with all requirements, including 40 CFR 192.12 clean-up standards; 40 CFR 61, Subpart Q radon emission standards; Utah Water Quality Control Standards; the Utah Occupational Safety and Health Act; State and Federal historic preservation laws; floodplain/wetland policy; and the Farmland Protection Policy Act.	Does not meet criterion.	Meets criterion. Overall radiologic risk reduction is 40% to the public when compared to existing conditions.

TABLE 8-1 (CONTINUED). SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

## FOR OPERABLE UNIT I, MILL TAILINGS AND MILLSITE PROPERTY

ALTERNATIVE	5. Short-Term Effectiveness	6. Implementability	7. Cost	8. State Acceptance	9. Community Acceptance
1. No Action	Does not meet criterion. Fails to control exposure pathways.	Implementable. Only annual monitoring performed.	Capital=\$0 Annual O & M=\$250K through 1996; \$42K through 2020 Present Worth=\$1,700K	No Support.	Low Support.
2. Tailings Removal and Transport to a Licensed Repository	Meets criterion. Worker and public protection from radiological contamination implemented by engineering controls. Highway deterioration and transportation related accidents would increase due to worker traffic and truck hauling (13.16 additional injury accidents and 0.12 fatalities). Involves highway transport of contaminated materials.	Moderately implementable due to existing repository license amendments and potential permits required.	Capital=\$86,400K Annual O & M=\$41K Present Worth=\$69,874K	Low; State policy disallows CERCLA wastes from disposal at licensed repositories. State does support millsite remediation.	Support is evident.
3. Tailings Removal and Disposal in a Repository On Site, South of the Present Location	Meets criterion. Worker and public protection from radiological contamination implemented by engineering controls. No contaminated materials transportation on public roads is involved. Small increase in transportation-related accidents due to worker traffic (1.09 additional injury accidents, 0.01 additional fatalities).	Easily implementable. No permits required under CERCLA for on-site disposal (substantive requirements will be met).	Capital=\$52,100K Annual O&M=\$41K Present Worth=\$42,302K	State supports on-site disposal and millsite remediation.	Support is evident.

TABLE 8-2. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

## FOR OPERABLE UNIT II, PERIPHERAL PROPERTIES

ALTERNATIVE	1. Overall Protection Of Human Health and the Environment	2. Compliance With Applicable or Relevant and Appropriate Requirements	3. Reduction of Toxicity, Mobility, or Volume of Contaminants by Treatment	4. Long-Term Effectiveness and Permanence
1. No Action	Does not meet criterion. Fails to control exposure pathways.	Does not meet criterion. Fails to meet 40 CFR 192 and others (including Clean Water Act, Clean Air Act, etc.).	Does not meet criterion. No treatment is involved.	Does not meet criterion. Fails to control exposure pathways.
2. Clean Up to 40 CFR 192.12 Standards	Meets criterion. Controls exposure pathways by removing the source of contamination. Environmentally sensitive construction and supplemental standards application assure environmental protection while protecting human health. Containment in the repository reduces contaminant mobility.	Meets criterion. Clean up will meet 40 CFR 192.12 or 40 CFR 192.22 standards, and will meet all requirements detailed in Appendix B (including specifics of the Clean Air Act, Clean Water Act, Occupational Safety and Health Act, etc.).	Remediation of properties does not meet the criterion.	Removal of contaminated materials is effective in eliminating the source of contamination. Ultimate disposal in a repository meeting the 40 CFR 192 performance requirements is a more permanent solution than the no-action alternative.

ALTERNATIVE	5. Short-Term Effectiveness	6. Implementability	7. Cost	8. State Acceptance	9. Community Acceptance
1. No Action	Does not meet criterion. Fails to control exposure pathways.	Implementable.	Negligible.	No Support.	Low community acceptance.
2. Clean up to 40 CFR 192.12 Standards	Engineering controls will be in place during remediation activities to assure that this criterion is met.	Implementable. Technologies for remediation are proven and readily available.	Estimated minimum cost is \$12,648,000. Estimated maximum cost is \$18,460,000.	The State of Utah supports clean up to 40 CFR 192 standards.	Overall community acceptance.

Alternatives 2 and 3 are equally protective of human health and the environment. Both alternatives would eliminate the source of ground-water and surface-water contamination by removing the tailings from their present location. During tailings removal activities, controls would be in place to limit dust generation and to prevent ground-water contamination. The tailings repositories for both alternatives would be designed to meet the repository performance requirements of 40 CFR 192, including cap design to minimize radon emanation. Alternatives 2 and 3 both reduce the mobility of contaminants by placing the tailings and associated materials in repositories conforming to the requirements of 40 CFR 192.

Current Environmental Protection Agency guidance requires an evaluation to be conducted every five years for alternatives in which contaminants remain on site (as with Alternative 3). These five year evaluations would allow assessment of whether future action or remediation would be required. Any problems with protectiveness identified in the five-year reviews will be addressed at that time.

#### 8.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternative 1, no action, would violate the Uranium Mill Tailings Radiation Control Act and implementing regulations at 40 CFR 192. The tailings piles would not meet disposal site design requirements nor would they meet the ground-water standards proposed to be added to 40 CFR 192. Continued contamination of Montezuma Creek and the alluvial aquifer would violate the Utah Water Pollution Control Act and Utah's Ground-Water Protection Act.

Alternative 2, removal of tailings and transport to an off-site licensed repository, would meet the applicable or relevant and appropriate requirements identified in Section 10 and detailed in Appendix B. For example, mill tailings removal and repository operations will comply with the applicable requirements under the Clean Air Act (40 CFR 61, Subpart Q), and State of Utah requirements for the control of fugitive dust emissions. All activities will comply with the Occupational Safety and Health Act requirements. Floodplain/wetlands requirements will be followed during the temporary diversion of Montezuma Creek and any impacts to wetlands will be mitigated. The State of Utah's Water Pollution Control Act will be adhered to if any discharges are made to Montezuma Creek. The existing repository would possibly need a license amendment to meet the requirements of 40 CFR 192. Also, to meet the pertinent requirements at the repository, it may be necessary to obtain Federal, State, or local permits.

Alternative 3, tailings removal and disposal on site, would meet all applicable or relevant and appropriate requirements identified in Section 10 and detailed in Appendix B. Mill tailings removal and repository operations will comply with applicable requirements under the Clean Air Act (40 CFR 61, Subpart Q), and State of Utah requirements for the control of fugitive dust emissions. All activities will comply with Occupational Safety and Health Act requirements. Floodplain/wetlands requirements of Executive Orders 11988 and 11990 will be followed when temporarily diverting Montezuma Creek and any impacts to wetlands will be mitigated. The State of Utah's Water Pollution Control Act will be adhered to if any discharges are made to Montezuma Creek. The repository would be designed to meet the requirements of 40 CFR 192. No Federal, State, or local permits would be required since the remedial action is performed on site; however, substantive permit requirements would be met.

#### 8.1.3 Reduction of Toxicity, Mobility, or Volume of Contaminants by Treatment

The no-action alternative does not reduce toxicity, mobility, or volume because all contaminated materials would be left in place. Alternative 2 and 3 do not include treatment of the mill tailings and therefore do not reduce toxicity, mobility, or volume by treatment.

#### 8.1.4 Long-Term Effectiveness and Permanence

The no-action alternative would result in the continuation of excessive long-term risk to the public; the total radiologic risk to Monticello residents would be  $2.38 \times 10^{-2}$  excess cancer mortalities (0.0238 additional cancers for the entire population) per year. This alternative would be neither effective nor permanent.

Alternative 2 achieves the greatest reduction in overall risk to the local population from radiological contamination, with a risk reduction of 41% from current conditions. This alternative achieves long-term effectiveness because the contaminant source is removed. Operation of the licensed repository in conformance with licenses and permits will help to assure that the alternative is also a more permanent solution than Alternative 1, and is as permanent as Alternative 3.

Alternative 3 achieves a 40% reduction in risk to the local population from radiological contamination when compared to current conditions. This risk reduction is slightly lower than the risk reduction achieved by Alternative 2 because the repository is located closer to the local community. The nonradiologic risk index for Monticello residents after remediation is 0.09, which means that the cumulative exposure to nonradiologic constituents is less than the cumulative acceptable intake, and is therefore an indicator of no adverse health effects. A nonradiologic risk of 1.0 or greater indicates potential adverse health effects. This alternative achieves long-term effectiveness because the contamination source is removed. The tailings repository would be designed and maintained in accordance with the regulations identified in Section 10 of this document; the alternative is more permanent than Alternative 1, and is as permanent as Alternative 2.

#### 8.1.5 Short-Term Effectiveness in Protecting Human Health and the Environment

The no-action alternative does not entail short-term effectiveness considerations; therefore, it does not meet this criterion, as the criterion is not applicable.

Alternatives 2 and 3 would involve identical short-term impacts during the removal of contaminated materials from the millsite. Radiological impacts to workers and the public will be minimized by engineering controls during remediation activities. A controlled work site will be maintained to limit access to the millsite and areas of construction. Dust suppressants will be utilized and air monitoring will be performed. The State of Utah's Occupational Safety and Health Act will be followed.

Alternative 2 includes additional impacts due to haulage of contaminated materials on public roads. The number of expected transportation injuries and fatalities will increase due to the number of vehicles hauling on roadways, with 13.16 additional highway injuries and 0.12 fatalities occurring. The rate of highway deterioration will also increase. Alternative 3 transportation impacts are due only to worker transportation to and from the work site on public roads. All haulage of contaminated material will be done on site. An additional 1.09 transportation injuries and 0.010 fatalities can be expected for on-site disposal of the mill tailings.

#### 8.1.6 Implementability

The no-action alternative is relatively easy to implement because environmental monitoring currently exists and is the only activity involved.

Alternatives 2 and 3 would be equally implementable during removal of contaminated materials. Conventional excavation technology is effective and proven in removing source material such as tailings. Alternative 2 is more difficult to implement with regard to the repository because an existing licensed repository would have to amend its license prior to accepting

millsite materials. Since disposal activities are off site, Federal, State, and local permits may be required. Disposal in an on-site repository, Alternative 3, has neither of these concerns.

#### 8.1.7 Cost

The no-action alternative is the least expensive to implement. Capital costs are zero. Annual operation and maintenance costs for the environmental monitoring to be performed under this alternative are \$250,000. The present worth of Alternative 1 using a 5% discount rate (i.e., an interest rate of 5% after inflation) is \$1,700,000.

Removal of tailings and transport to a licensed repository (Alternative 2) has capital costs of \$86,400,000 (in 1989 constant dollars) to achieve a cell that complies with 40 CFR 192 requirements, and annual operations and maintenance costs of \$41,000. The present worth of the entire remedial action using a 5% discount rate (using a real interest rate of 5%; or, an interest rate that is 5% higher than the inflation rate) is \$69,874,000.

Capital costs for tailings removal and disposal in a repository on site (Alternative 3) are \$52,100,000, in 1989 constant dollars. Annual operations and maintenance costs are \$41,000. The present worth using a 5% discount rate, as defined previously, is \$42,346,000. The remedial investigation/feasibility study report provides details for all costs.

#### 8.1.8 State Acceptance

The no-action alternative does not have State of Utah support, as evidenced by the State's signing of the Federal Facility Agreement. The State currently has a policy excluding certain wastes from disposal at licensed repositories and has not accepted Alternative 2. Alternative 3 is acceptable to the State of Utah.

#### 8.1.9 Community Acceptance

Although some local residents are not convinced that the mill tailings pose a problem, community acceptance of the no-action alternative is low. Local mining interests are favorable to Alternative 2 as is the local public in general. The local public is also supportive of Alternative 3.

### 8.2 OPERABLE UNIT II -- PERIPHERAL PROPERTIES

#### 8.2.1 Protection of Human Health and the Environment

The no-action alternative fails to protect human health and the environment because it does not control the major exposure pathways of radon emissions and exposure to gamma radiation. Alternative 2, peripheral property remediation, is protective of human health and the environment because the contamination source is removed and would ultimately be disposed of in a repository meeting the requirements of 40 CFR 192. Contaminant mobility is also reduced by containment in the repository. The potential of using environmentally sensitive construction techniques and supplemental standards application on properties where environmental harm is excessive further assures protection of both human health and the environment. Prior to using supplemental standards at peripheral properties where environmental damage is grossly disproportionate to health benefits, the selected remedial action must come as close to meeting the otherwise applicable standards as is reasonably possible under the circumstances and must not pose a clear present or future hazard.

#### 8.2.2 Compliance with Applicable or Relevant and Appropriate Requirements

The no-action alternative fails to meet the clean-up standards of 40 CFR 192. Remediation of the peripheral properties to 40 CFR 192.12 standards assures compliance with this requirement. Clean up will allow the State of Utah Water

Pollution regulations to be met for discharges to Montezuma Creek. All remediation activities will be performed in compliance with the Occupational Safety and Health Act and Utah's rules for control of fugitive dust emissions. This alternative will meet all other applicable or relevant and appropriate requirements detailed in Appendix B.

#### 8.2.3 Use of Treatment to Achieve a Reduction in Toxicity, Mobility or Volume of Contaminants

No treatment is involved with the no-action alternative, so this criterion is not met. Remediation of the peripheral properties does not meet the criterion because no treatment is involved.

#### 8.2.4 Long-Term Effectiveness and Permanence

The no-action alternative does not meet this criterion because the source of contamination is left in place. Under Alternative 2, the contaminated materials will ultimately be placed in a repository meeting the performance requirements of 40 CFR 192; this is an effective solution and is more permanent than the no-action alternative.

#### 8.2.5 Short-Term Effectiveness

The no-action alternative does not involve short-term effectiveness considerations; therefore, the criterion is not applicable and is not met. Alternative 2, remediation of the peripheral properties, meets the criterion through engineering controls during remediation activities. For example, suppressants would be applied to control fugitive dust emissions, air-monitoring would be performed to determine when respiratory protection is needed, and the radiation dose to workers would be monitored by film badges.

#### 8.2.6 Implementability

The no-action alternative is implementable because no activity is required. Alternative 2 is also implementable because the technology, services, and materials to perform either conventional or environmentally sensitive construction are proven and readily available.

#### 8.2.7 Cost

The cost of the no-action alternative is negligible. The estimated minimum cost for remediation of the properties, Alternative 2, is \$12,648,000 using conventional construction on all properties except the cemetery and densely-vegetated hillsides south of Montezuma Creek (where supplemental standards could be applied). The estimated maximum cost, assuming environmentally sensitive construction is used on all heavily vegetated hillsides and conventional construction is used elsewhere, is \$18,460,000.

#### 8.2.8 State Acceptance

The State of Utah is not supportive of the no-action alternative, as evidenced by its signing of the Federal Facility Agreement. The State supports remediation of the peripheral properties to the standards of 40 CFR 192. The State of Utah also concurs with the possible use of Supplemental Standards on hillside dense vegetation south of the millsite.

#### 8.2.9 Community Acceptance

Community support for the no-action alternative is low, although some residents doubt that a real risk is posed by the mill tailings-related contamination. Overall, the community is supportive of the remediation alternative (see Appendix A for details).

## 9.0 SELECTED REMEDY

The selected remedy for the Monticello Mill Tailings Site involves removal of tailings, by-product material (as defined in Section 11(e)(2) of the Atomic Energy Act of 1954 as amended, and in 40 CFR Part 192 to mean "tailings or waste produced by the extraction or concentration of uranium from any ore processed primarily for its source material content"), and contaminated buildings and equipment material, with disposal of these materials on site for Operable Unit I; and remediation to 40 CFR 192 standards for Operable Unit II, peripheral properties, by either conventional or environmentally sensitive construction, or in limited cases, the use of supplemental standards. Ground-water and surface-water restoration will be addressed in a separate Record of Decision following initiation of remediation for Operable Units I and II.

Detailed descriptions of the selected alternatives follow. The remediation goals, corresponding risk levels to be attained, and points of compliance for each medium addressed by the remedy, are discussed. Finally, a detailed discussion of the costs of each component of the remedy is presented.

### 9.1 SELECTED ALTERNATIVES

#### 9.1.1 Operable Unit I -- Removal of Tailings and Disposal in a Repository On Site, South of the Present Location

The selected alternative for Operable Unit I would relocate the mill tailings, by-product material, and contaminated building and equipment materials, to property south of and adjacent to the present millsite (see Figure 9-1). The contaminated materials will be moved out of the Montezuma Creek floodplain and the tailings piles will be removed from their current contact with the alluvial aquifer. This action has been determined to be an on-site response action by the Environmental Protection Agency. On the basis of current information, this alternative provides the best balance of trade-offs among the alternatives with respect to the five balancing criteria used to evaluate alternatives (see Table 8-1).

This remedy will require removal to a property contiguous to and adjacent with a contaminated peripheral property south of the millsite. The proposed repository site is not owned by the Department of Energy and would need to be purchased. Remedial activities would be conducted on site and would be exempt from the necessity of obtaining all Federal, State, and local permits; however, the substantive requirements of these permits would be met.

The primary goal of the remedial action for Operable Unit I is to eliminate the potential for exposure of the population of Monticello to enhanced levels (above background) of radon gas and gamma radiation that pose excess cancer risks. Following remediation, the radiologic risk to the population will be reduced by 40% from the current conditions.

The occurrence of chemically hazardous substances not associated with tailings or process-waste exposure has been pursued, but has yielded no substantive evidence of contamination by these substances. Therefore, no public health evaluation was performed for these substances. If during remedial action, hazardous wastes are encountered on site, they shall be remediated and disposed of in accordance with the Resource Conservation and Recover Act and any other applicable regulations. By-product material associated with mill processing will be disposed of in the repository.

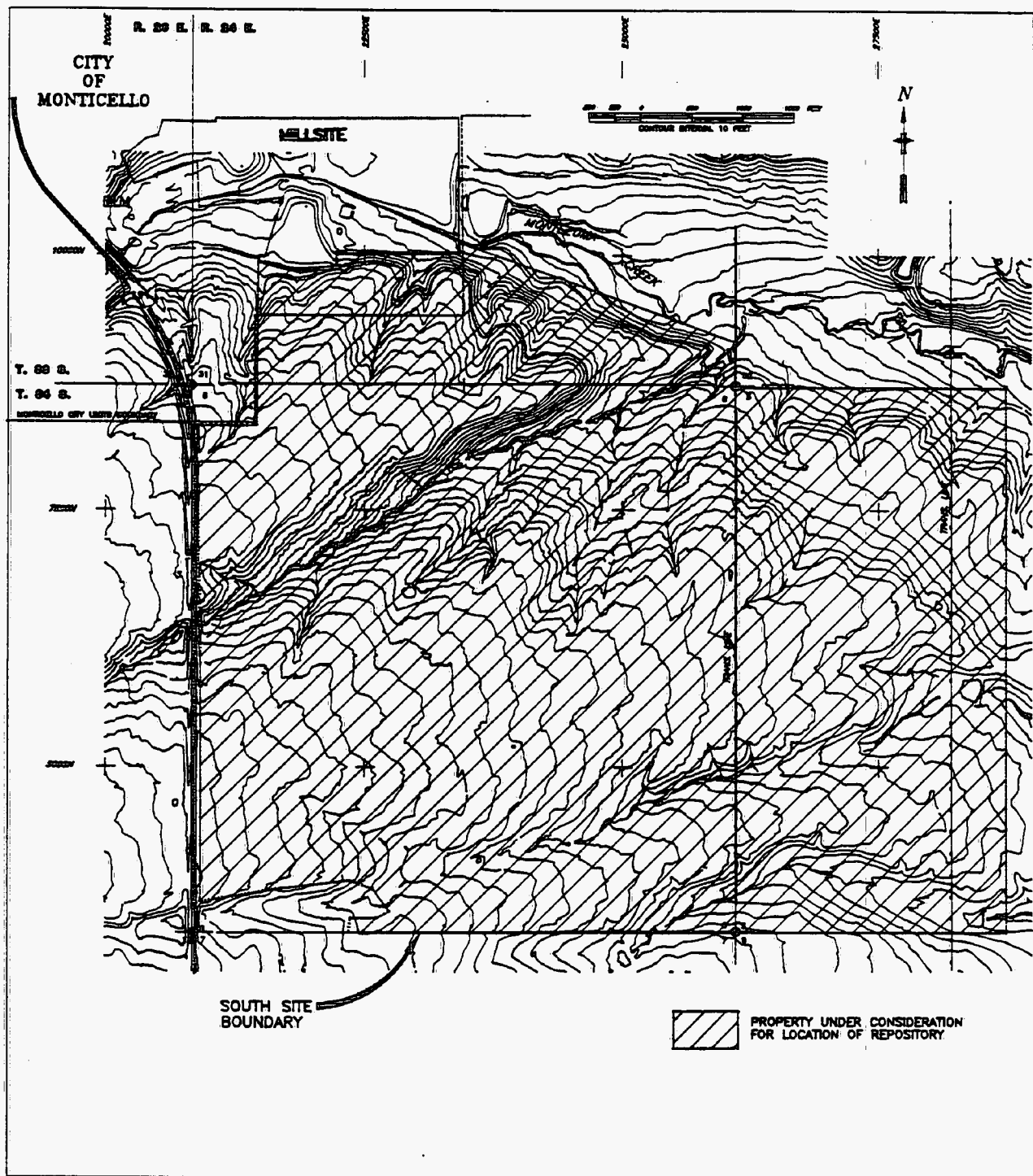


Figure 9-1. On-Site Stabilization South of Present Site Operable Unit I - Alternative 1

Radiologically contaminated building materials and mill equipment will be, to the extent practical and in accordance with prevailing standards, decontaminated and either released for unrestricted use as defined by Department of Energy Orders, released for restricted use as defined by Department of Energy Orders, or disposed of in a sanitary landfill. The repository will be used for disposal of some of this radiologically contaminated material, but the quantity will be kept to a minimum and materials will be disposed of in strict accordance with the repository design specifications.

An additional remediation goal is to eliminate the potential for leaching of contaminants in the mill tailings to ground water and surface water. These goals will be achieved by diverting Montezuma Creek away from its current channel where it is in contact with mill tailings piles, removing the tailings and relocating them to the secure repository, replacing the tailings piles with clean fill, grading and revegetating the site to provide proper surface drainage, and reconstructing the channel of Montezuma Creek to its pre-millsite historic location. In addition, any dewatering of tailings or water removed from contaminated soils will be treated and released to the environment. If discharged to Montezuma Creek, the waste water would be treated to meet Utah's requirements for discharge to surface waters (U.C.A. Title 26, Chapter 11: R-448-8 U.A.C.).

The remediation of the mill tailings and associated materials will comply with the principal relevant and appropriate requirement, 40 CFR Part 192.12, which specifies the maximum permissible concentration of radium-226 above background levels. Soils with radium-226 concentration above 6 pCi/g in the 0-to 6-inch (15 cm) layer, and 16 pCi/g in any subsequent 6-inch (15 cm) layer below 6 inches (15 cm) are considered to be contaminated and will be removed (using an average background level of  $1.0 \pm 0.4$  pCi/g).

The tailings repository would be designed to contain approximately 2.5 million cubic yards of tailings and contaminated materials and would cover approximately 40 acres of disposal area. It is estimated that about 1.9 million cubic yards of contaminated material will be removed and transported to the repository. Materials removed from peripheral properties will be temporarily stored at the mill tailings site, and then transported to the repository. Included in the contaminated material to be received at the repository is approximately 100,000 cubic yards of contaminated soil and building materials from the Monticello Vicinity Properties National Priorities List site (this material was the subject of the Monticello Vicinity Properties Record of Decision).

Design components of the tailings repository will be based on the Department of Energy's Uranium Mill Tailings Remedial Action Program research and practice standards (including the latest revision of the Technical Approach Document, Revision 2, December 1989, DOE/AL-050425.0002). During design, engineering considerations will take into account such factors as radon gas minimization, erosion control, dust control, water infiltration control, and site security. The State of Utah and the Environmental Protection Agency will have review authority on remedial design activities to ensure that the most appropriate technology is used in the final design. The repository will be designed to comply with the requirements of 40 CFR Part 192, which requires that the repository be designed to:

- Be effective for at least 200 years and to the extent reasonably achievable, to be effective for up to 1,000 years;
- Provide reasonable assurance that releases of radon-222 from residual radioactive material will not exceed an average release rate of 20 picocuries per square meter per second ( $\text{pCi}/\text{m}^2/\text{s}$ ); and

- Provide reasonable assurance that releases of radon-222 from residual radioactive material will not increase the average concentration of radon-222 in air at or above any location outside the disposal site by more than 0.5 pCi/L.

The compliance point for the standards applying to radon-222 emissions is the entire surface of the repository. In addition, proposed additional standards to 40 CFR Part 192.32 (Subpart D), require that uranium mill tailings be managed to conform to the ground-water protection standards and with monitoring requirements of 40 CFR Part 264.92 (Subpart F). The point of compliance for monitoring is defined in 40 CFR Part 264.95 as being the vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated units.

The costs of remediation of Operable Unit I are presented in Table 9-1. The total capital cost of the project, in 1989 dollars, is estimated to be \$52.1 million, including contingency costs of \$8.69 million. Annual operation and maintenance costs in 1989 dollars are estimated to be \$40,800 per year for the period 1996 to 2020, including contingency costs of \$6,800 per year. The total project cost in 1989 dollars calculated using a discount rate of 5 percent is estimated to be \$42.346 million.

Some changes may be made to the selected remedy as a result of the remedial design and construction process. In general, such changes will reflect relatively minor modifications resulting from the engineering design process.

#### 9.1.2 Operable Unit II -- Peripheral Properties Clean Up to 40 CFR 192.12 Standards

The proposed action consists of removal of contaminated materials and relocation to the millsite tailings pile, with ultimate disposal in the repository described for Operable Unit I. Removal will be achieved by environmentally sensitive construction practices, and/or conventional construction techniques to meet the standards of 40 CFR 192.12. Techniques will vary depending on the degree of contamination and the environmental consequences of remediating specific land types.

The occurrence of chemically hazardous substances not associated with tailings or process-waste exposure has been pursued, but has yielded no substantive evidence of contamination by these substances. Therefore, no public health evaluation was performed for these substances. If during remedial action, hazardous substances or materials not excluded from the Resource Conservation and Recovery Act [e.g., 40 CFR 261.4(a)(ii)(4) source, spent nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended, U.S.C. 2011, et seq.] are found on site, they shall be remediated and/or disposed of in accordance with applicable regulations, including Resource Conservation and Recovery Act requirements, if determined to be applicable or relevant and appropriate. Any by-product material associated with mill processing and found on peripheral properties, will be disposed of in the repository.

Table 9-1. Estimated Costs of the Selected Remedy for Operable Unit I  
(Removal of Tailings and Disposal On Site. South of  
Present Location)

<u>Capital Costs</u>		<u>Total</u>
Millsite Site Preparation	\$	740.000
Repository Site Preparation		7,160.000
Millsite Remediation (removal)		7,350.000
Construction of Repository		7,480.000
Millsite restoration		2,125.000
Repository restoration		2,360.000
Mobilization/demobilization		815.000
Indirect Costs		<u>15,420.000</u>
Subtotal		\$43,450.000
Contingency (at 20%)		<u>8,690.000</u>
Total Project Costs (1989 dollars)		\$52,140.000
<u>Operation and Maintenance Annual Costs</u>		<u>Annual Cost</u>
Groundwater monitoring and surveillance (1996-2020)		\$34.038
Contingency (at 20%)		<u>6.808</u>
Total annual O&M costs (1989 dollars)		\$40.846
1989 TOTAL PRESENT WORTH (present worth calculated using a 5% discount rate)		<u>\$42,346.400</u>

Soils with radium concentrations above 6 pCi/g in the 0 to 6 inch layer of soil and concentrations above 16 pCi/g in each subsequent 6 inch increment below the top layer are considered to be contaminated (using a background concentration of  $1.0 \pm 0.4$  pCi/g) and will be removed. The peripheral properties include irrigated mesa pasture lands, areas of dense hillside vegetation, low hillside vegetation, hilltop dryland pasture, creek-bottom pasture, the U.S. Bureau of Land Management compound, creek banks along upper Montezuma Creek and the Monticello Cemetery. The properties constituting upper and lower Montezuma Creek will be remediated with Operable Unit III, following initiation of remediation for Operable Units I and II.

In areas with mature dense vegetation, hand excavation could be used successfully to remove the contaminated soils and to minimize environmental damage to those areas that have important wildlife habitat. An option to hand excavation would be the use of high-suction vacuum equipment specifically designed for cleaning up hazardous waste spills. This equipment has costs similar to hand excavation yet would tend to clean up more precisely the actual areas of contamination.

Where acceptable, conventional construction techniques will be used to remove contaminated soils from specific areas, including those previously disturbed, such as farm land. This involves the use of large earthmoving equipment to remove the contaminated soil. The removed soil would be replaced with clean material and the site would be revegetated. On several properties, a combination of conventional and environmentally sensitive construction techniques will be used. As a result of meeting the contaminant-specific applicable or relevant and appropriate requirements, it is expected that exposure of inhabitants in the Monticello area to health risks from radiation in excess of background levels will be reduced to acceptable levels. Radiation risks are primarily associated with inhalation of radon-222 and exposure to gamma radiation. Where conventional or environmentally sensitive construction techniques are used to remove contaminated materials, radiologic risks will be reduced to background levels. Nonradiologic long-term risk to individuals after peripheral property remediation was included in the comparative analysis of Operable Unit I, and is considered insignificant.

The Environmental Protection Agency and the State of Utah will evaluate proposals for the use of supplemental standards on densely vegetated hillsides south of Montezuma Creek and at the Monticello Cemetery during remedial design. Supplemental standards, which allow leaving contamination in place, are standards included within the principal relevant and appropriate requirement, 40 CFR 192. These standards are typically applied to areas where physical removal of materials would cause undue environmental damage in comparison with the derived environmental and health benefits. In areas where supplemental standards may be applied, radiation dose is currently estimated to be within 1 percent of health-based standards.

Operable Unit II consists of an estimated 311,600 cubic yards of contaminated material (including 8,000 cubic yards of material to which supplemental standards may apply). The capital costs of remediation of this operable unit are presented in Table 9-2. Unit costs have been presented for each land type and each construction alternative where more than one construction alternative is available. Therefore, a range of total costs is presented. The costs range from \$12.648 million (assuming conventional construction techniques are used on all properties except that supplemental standards are applied to the cemetery and south hillside) to \$18.460 million (assuming that supplemental standards are not used, environmentally sensitive construction techniques are used to the maximum extent possible, and conventional techniques are used elsewhere). The total costs are provided in 1989 dollars, and calculated using a discount rate of 5 percent. The costs include transporting the contaminated material to the millsite. Costs of subsequent transport and disposal of the material at the repository south of the millsite are included in the cost of remediation of Operable Unit I.

Table 9-2. Estimated Costs of the Selected Remedy for Operable Unit II  
(Peripheral Properties Clean Up to 40 CFR 192 Standards)

Land Type	Construction Alternative <sup>1</sup>	Cubic Yards	Cost Per Cubic Yard	Direct and Indirect Capital Costs of Site Preparation, Removal, & Restoration Contingencies Total 1989 Dollars		
				Subtotal	@ 20%	
A (Mesa irrigated Pasture)	Conventional	16,360	\$24.33	\$ 398,000	\$ 79,600	\$ 480,000
B (Hillside dense vegetation)	Conventional	33,120	38.53	1,276,000	255,200	1,530,000
B (Hillside dense vegetation)	Environmentally Sensitive	33,120	117.81	3,902,000	780,400	4,680,000
BSS (Hillside dense vegetation including BSS')	Conventional	24,800	47.34	1,174,000	234,800	1,410,000
BSS' (Properties South of Montezuma Creek)	Environmentally Sensitive	24,800	120.32	2,984,000	596,800	3,580,000
	Supplemental Standards	6,000	0 (120.32)*	0 ( 722,000)	0 (144,000)	0 ( 866,000)
C (Hillside low vegetation)	Conventional	55,550	37.59	2,088,000	417,600	2,510,000
D (Hilltop dryland pasture)	Conventional	70,800	32.34	2,290,000	458,000	2,750,000
E (Creek bottom)	Conventional	95,230	31.52	3,002,000	600,400	3,600,000

\*Should Supplemental Standards not be approved, incremental costs would be as shown.

Table 9-2 (continued). Estimated Costs of the Selected Remedy for Operable Unit II  
(Peripheral Properties Clean Up to 40 CFR 192 Standards)

Land Type	Construction Alternative <sup>1</sup>	Cubic Yards	Cost Per Cubic Yard	Direct and Indirect Capital Costs of Site Preparation, Removal, & Restoration		
				Subtotal	Contingencies @ 20%	Total 1989 Dollars
FSS (Monticello Cemetery)	Conventional	2.000	59.50	119,000	23,800	140,000
	Supplemental Standards	2.000	0	0	0	0
G (BLM Compound)	Conventional	7.070	59.12	418,000	83,600	500,000
H (Upper Montezuma Creek Bank)	Conventional	6.670	27.29	182,000	36,400	220,000
Minimum Total Project Costs <sup>2</sup>	Conventional and supplemental standards	303,600		10,534,500	2,106,900	12,647,500
Maximum Total Project Costs <sup>3</sup>	Conventional and Environmentally Sensitive	311,600		15,383,000	3,076,600	18,460,000

<sup>1</sup>Supplemental standards may be applied to land types BSS' and FSS.

<sup>2</sup>Minimum total project cost assumes that conventional construction techniques will be used in all areas, except BSS' and FSS where supplemental standards will apply. Cost per cubic yard applies to conventional construction only.

<sup>3</sup>Maximum total project cost assumes that environmentally sensitive construction techniques will be used for land types B, BSS, and BSS', and conventional techniques elsewhere.

## 9.2 SIGNIFICANT DIFFERENCES FROM THE PROPOSED PLAN

The Proposed Plan was released for public comment in October 1989. The plan identified three operable units to be remediated at the Monticello Mill Tailings Site. The decision made for remediation of Operable Unit I remains as identified in the Proposed Plan. Operable Unit II will be remediated with Operable Unit I except that the Upper and Lower Montezuma Creek properties will be remediated with Operable Unit III. Selection of a preferred alternative for Operable Unit III, Ground Water and Surface Water, has been delayed until remediation of the other two operable units is underway. A decision for restoration of this operable unit is postponed because surface water and aquifer characteristics will necessarily change during remediation activities for Operable Units I and II. Following data collection and analysis during and following Operable Units I and II remediation, the Department of Energy, the Environmental Protection Agency, and State of Utah will determine the additional steps needed to restore the alluvial aquifer. The aforementioned parties will work together under the existing Federal Facilities Agreement to develop a Record of Decision pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, and in accordance with the requirements of the National Contingency Plan.

This approach differs from that in the Proposed Plan for Operable Units II and III. While it is considered a significant change, a new public comment period is not required at this time, but will be included in the development of a surface- and ground-water Record of Decision at a later date.

## 10.0 STATUTORY DETERMINATIONS

The selected remedy meets the statutory requirements of Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act. The statutory determinations for the preferred surface- and ground-water remedy (Operable Unit III) will be discussed in a separate Record of Decision that will be prepared following the initiation of remediation of Operable Units I and II and the collection and analysis of additional monitoring data.

### 10.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy for Operable Unit I (mill tailings and millsite property) and Operable Unit II (peripheral properties) protects human health and the environment through the following engineering controls:

- Excavation of all materials at the millsite contaminated at levels above health-based standards specified under the Uranium Mill Tailings Radiation Control Act in 40 CFR 192.12;
- Relocation of the contaminated materials to a repository constructed to meet design standards and monitoring standards of the Uranium Mill Tailings Radiation Control Act.

The selected remedy for Operable Unit I will eliminate the source of ground-water and surface-water contamination. The selected remedy will result in a 40 percent reduction in radiologic risk to the Monticello population. After tailings removal, the annual cancer risk to the Monticello population from radioactive constituents would be  $1.43 \times 10^{-2}$  as compared to the existing level of  $2.38 \times 10^{-2}$  (or, 0.0143 additional cancers per year for the entire population compared to the existing estimate of 0.0238 cancers). Although the millsite remediation will follow health-based remediation standards for the radioactively contaminated materials (40 CFR 192.12) to achieve acceptable risk, a gross estimate was made for the excess lifetime cancer incidence to an individual following remediation. The estimate is  $6 \times 10^{-6}$  excess cancer incidences due to radiologic constituents for an individual, following remediation. Because the Environmental Protection Agency's acceptable risk

range is from  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$  excess lifetime cancers. this rough estimate could be low by nearly two orders of magnitude and still be below the upper bound of the acceptable risk range. The selected remedy will not pose unacceptable short-term risks and will decrease cross-media impacts. The nonradiological risk index for Monticello residents after completion of the selected remedy for Operable Unit I is "0.09". which is an indication of no adverse health effects. (The Environmental Protection Agency considers a risk index greater than 1.0 to be indicative of adverse health effects.)

The remedy selected for Operable Unit I minimizes adverse impacts to floodplain/wetlands and waters of the U.S. through the avoidance of unnecessary impacts to these areas. Where adverse impacts are unavoidable, there is a determination of meeting the substantive requirements of the Clean Water Act, Executive Order 11988 and 11990. Mitigation of unavoidable impacts to these areas will be accomplished through floodplain/wetland restoration and creation projects, and channel reconstruction.

The selected remedy for Operable Unit II (Peripheral Properties) will protect human health and the environment through the following engineering controls:

- Excavation of contaminated materials using either conventional or environmentally sensitive construction techniques in areas where removal is required to meet health-based standards of 40 CFR 192.12;
- Relocation of the excavated material to a repository as described for Operable Unit I.

The selected remedy for Operable Unit II will reduce radiologic risks to the exposed segment of the populations of Monticello primarily by removal of soils contaminated with gamma radiation-emitting contaminants such as radium-226. The long-term radiologic risk to Monticello residents after peripheral property remediation (except for areas where supplemental standards are applied) is estimated to be background. As for Operable Unit I, the selected remedy will not pose unacceptable short-term risks and will decrease cross-media impacts.

## 10.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Under Section 121(d)(1) of the Comprehensive Environmental Response, Compensation, and Liability Act, (42 U.S.C. § (d)(1)), remedial actions must attain a degree of clean up which assures protection of human health and the environment. Additionally, remedial actions that leave any hazardous substance, pollutant, or contaminant on site must meet a level or standard of control that at least attains standards, requirements, limitations, or criteria that are "applicable or relevant and appropriate" under the circumstances of the release.

"Applicable" requirements are those clean-up standards, standards of control and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant or contaminant, remedial action, location, or other circumstance at a remedial action site. "Relevant and appropriate" requirements are clean-up standards, standards of control and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a remedial action site, address problems or situations sufficiently similar to those encountered at the site that their use is well-suited to the particular site. See the National Contingency Plan (40 CFR Section 300.6) for further information.

There are three types of requirements governing remedial actions. The first type includes "contaminant-specific" requirements which set limits on concentrations of specific hazardous substances, pollutants, and contaminants

in the environment. An appropriate example of this type of requirement for the Monticello Mill Tailings Site is the 40 CFR Part 192 clean up standard for residual radioactive materials. The second type of requirement includes location-specific requirements that set restrictions on certain types of activities based on site characteristics. These include restrictions on activities in wetlands, floodplains, and historic sites. The third type of requirement includes action-specific requirements. These are technology-based restrictions which are triggered by the type of action under consideration. Occupational Safety and Health Act standards which regulate worker health and safety are action-specific requirements.

In determining whether requirements are "relevant and appropriate", the Environmental Protection Agency and the State of Utah have looked at the remedial actions proposed, the hazardous substances present, the waste characteristics, the physical characteristics of the site, the population at risk, and other appropriate factors. The Environmental Protection Agency and the State of Utah reviewed Federal and State laws, standards, requirements, criteria and limitations for possible application to the Monticello Mill Tailings Site. Tables 1.3 and 1.7 in the feasibility study identify the potential requirements screened by the Environmental Protection Agency and the State. Table B-1 in Appendix B identifies those which have been determined to be "applicable" or "relevant and appropriate". The Environmental Protection Agency has determined that there are no applicable or relevant and appropriate public health and environmental requirements of Federal or State laws that the selected remedies for Operable Unit I and II (millsite and tailings, and peripheral properties, respectively) will not meet, and therefore no Superfund Amendments and Reauthorization Act Section 121(d)(4) waivers would be involved.

A brief discussion of the principal applicable or relevant and appropriate requirements for Operable Units I and II and how the remedies will satisfy the requirements follows:

#### 10.2.1 Contaminant-Specific Requirements

The Environmental Protection Agency Standards for Remedial Action at Inactive Uranium Processing Sites, 40 CFR Part 192, is the principal contaminant-specific requirement identified for the Monticello Mill Tailings Site, Operable Units I and II.

For properties contaminated with uranium processing residues, these standards establish limits for the gamma radiation level and annual average radon decay product concentration in any occupied or habitable building and for the radium concentration in soil on open lands. However, they are not directly applicable to the Monticello Mill Tailings Site because the standards apply only to certain specifically designated sites where uranium was processed. The standards are relevant and appropriate to the millsite and peripheral properties for the following reasons:

- The Monticello site is an inactive uranium mill tailings site which is owned by the Federal government.
- The regulations were promulgated to control tailings which were dispersed into the environment and pose a threat to human health and the environment. The inactive Monticello uranium mill tailings site is characterized by large above-surface and subsurface uranium process residue/tailings piles which pose a danger to the public. Dispersion of contaminants into the environment through air, ground water, and surface water pathways has occurred.

- The numeric standards for health and environmental clean up would be relevant and appropriate for corrective action. Uranium and vanadium were processed at the site, and it is the gross alpha, radium-226, radium-228, and metals content of uranium processing wastes that are regulated by these standards.
- The regulations allow for situations where numerical standards may be inappropriate and allow other standards (supplemental standards) to be used for remedial actions where the action would produce environmental harm in excess of the derived health benefits. The supplemental standards could pertain to the proposed remedial action involving the clean-up portion of steep slopes, and the Monticello Cemetery.

The selected remedy will meet 40 CFR 192, Subpart A requirements by proper design of the repository cell. Design parameters of the repository will follow the latest Uranium Mill Tailings Remedial Action Program guidance, developed to assure compliance with 40 CFR 192 performance criteria. Repository components finalized during the design phase will be chosen to meet the minimum of 200-year effectiveness and the desired 1,000-year effectiveness requirements, including a radon cap placed on the pile to minimize radon gas emanation. Water infiltration through the pile and erosion of the pile will be minimized by top cover and side slope design. The 40 CFR 192, Subpart A standards follow:

"Subpart A - Standards for the control of Residual Radioactive Materials from Inactive Processing Sites

192.02      Standards

Control shall be designed to:

- (a) Be effective for up to one thousand years, to the extent reasonably achievable, and, in any case, for at least 200 years, and,
- (b) Provide reasonable assurance that releases of radon-222 from residual radioactive material to the atmosphere will not:
  - (1) Exceed an average release rate of 20 picocuries per square meter per second, or
  - (2) Increase the annual average concentration of radon-222 in air at or above any location outside the disposal site by more than one-half picocurie per liter."

The requirements of 40 CFR 192, Subpart B will be followed as clean-up standards for peripheral properties and for the millsite itself. Subpart C requirements will be followed by the Department of Energy when proposing the use of supplemental standards at the Monticello Cemetery and densely vegetated hillsides on the south side of Montezuma Creek. The subparts follow:

"Subpart B - Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites

192.12      Standards

Remedial actions shall be conducted so as to provide reasonable assurance that, as a result of residual radioactive materials from any designated processing site:

- (a) The concentration of radium-226 in land averaged over any area of 100 square meters shall not exceed the background level by more than -

- (1) 5 pCi/g. averaged over the first 15 cm of soil below the surface. and
  - (2) 15 pCi/g. averaged over 15 cm thick layers of soil more than 15 cm below the surface.
- (b) In any occupied or habitable building -
- (1) The objective of remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) that shall not exceed 0.03 WL. and
  - (2) The level of gamma radiation shall not exceed the background level by more than 20 microrentgens per hour."

#### Subpart C - Implementation (summarized)

##### 192.21 Criteria for Applying Supplemental Standards

The implementing agencies may apply standards in lieu of the standards of Subparts A or B if certain circumstances exist, as defined in 192.21.

##### 192.22 Supplemental Standards

"Federal agencies implementing Subparts A and B may in lieu thereof proceed pursuant to this section with respect to generic or individual situations meeting the eligibility requirements of 192.21."

- (a) "...the implementing agencies shall select and perform remedial actions that come as close to meeting the otherwise applicable standards as is reasonable under the circumstances."
- (b) "...remedial actions shall, in addition to satisfying the standards of Subparts A and B, reduce other residual radioactivity to levels that are as low as is reasonably achievable."
- (c) "The implementing agencies may make general determinations concerning remedial actions under this Section that will apply to all locations with specified characteristics, or they may make a determination for a specific location: the Department of Energy shall inform any private owners and occupants of the affected location and solicit their comments. The Department of Energy shall provide any such comments to the other implementing agencies (and) shall also periodically inform the Environmental Protection Agency of both general and individual determinations under the provisions of this section."

Protection of ground water is also provided for in 40 CFR Part 192 (a)(2) and (3). The Department of Energy has agreed to comply with the "Proposed Standards for Remedial Action at Inactive Uranium Mill Processing Sites with Ground-Water Contamination" (52 FR 36000, September 24, 1987). Although neither applicable or relevant and appropriate, these standards are "to be considered" and are further discussed in Section 10.2.5.

A second contaminant-specific requirement for the Monticello Mill Tailings Site is the Clean Air Act, National Emission Standard for Hazardous Air Pollutants (40 CFR Part 61, Subpart Q, Section 61.192) which sets standards for emissions of Radon-222 into the air from storage and disposal facilities for radium-containing material. No source at a Department of Energy facility shall emit more than 20 pCi/m<sup>2</sup>-s (per unit of time) of radon-222 as an average for the entire source. This is an applicable requirement for the Monticello

Mill Tailings Site, at the existing millsite tailings piles and at the new tailings repository. The radon barrier for the repository will be designed to meet the radon emanation requirements. A compliance agreement between the Environmental Protection Agency, the State of Utah, and the Department of Energy will be negotiated during remedial design to meet the requirements of this regulation.

The State of Utah's Standards for Quality for Waters of the State (Title 26, Chapter 11, U.C.A. R448-2 UAC) and the Utah Pollution Discharge Elimination System (Title 26 Chapter 11, UCA, R448-8 U.A.C.) are applicable to any surface waters discharged from the site. For Operable Unit I, this will include surface water discharges resulting from the dewatering of tailings, pore water from contaminated soils, water collected in the repository (disposal cell) during construction or placement of the tailings and/or other surface waters collected on site. Any of these waste waters entering Montezuma Creek shall be treated to comply with the discharge requirements and to meet the water quality standards.

The Utah Occupational Safety and Health Standards (Title 35, Chapter 9, U.C.A., R 500, U.A.C.) establish, implement, and enforce occupational health and safety standards similar to the Federal regulations. The State requirements incorporate the radiation exposure limits promulgated in 10 CFR Part 20. These standards are applicable to all work activities involved in the remediation of Operable Units I and II.

#### 10.2.2 Location-Specific Requirements

Physical characteristics of the Monticello Mill Tailings Site influence the type and location of remedial responses considered for Operable Units I and II. The location-specific requirements identified for the site (see Appendix B) establish consultation procedures with Federal and State agencies and may impose constraints on the location of remedial measures or may require mitigation measures. Location-specific requirements for Operable Units I and II relate to historic preservation, fish and wildlife, wetlands/floodplains, farmlands, and work in navigable waters.

Both Federal and State laws provide for protection of historical resources. There may be sites eligible for Federal or State historical registers. All regulations relating to historic preservation will be followed. Prior to disturbing peripheral properties, the State will be notified, and the results of archaeological surveys performed by the Department of Energy will be discussed to determine any mitigation necessary.

Wetlands and floodplain requirements will be applicable for both Operable Unit I and Operable Unit II. The tailings piles and the former millsite are in the floodplain of Montezuma Creek and the Corps of Engineers has identified wetlands along Montezuma Creek. Agency policy and guidance for carrying out the provisions of Executive Order 11988 "Floodplain Management" and 11990 "Protection of Wetlands" have been promulgated in 40 CFR Part 6 "Appendix A".

The Department of Energy has performed a floodplain/wetlands assessment, in accordance with 10 CFR 1022, "Compliance with Floodplain/Wetlands Environmental Review Requirements," the results of which are included in the Feasibility Study, Appendix B. Mitigation for floodplain/wetlands areas where impact is unavoidable include revegetation and replacement of soil where removed. Following diversion of Montezuma Creek during millsite remediation,

the creek will be returned to its pre-millsite historic channel. the channel will be vegetated with wetland species. revetments will be added to prevent bank erosion. and the stream bottom will be modified with rock riffle/pool structures to enhance aquatic habitat.

The Farmland Protection Policy Act (7 CFR Part 658) identifies standards and criteria for identifying and taking into account adverse impacts on significant/important agricultural lands. The U.S. Soil Conservation Service has stated in a letter dated 4. June 1990. that the proposed repository location does not meet the requirements of prime, unique or important farmland. Peripheral properties will also be evaluated to determine if significant/important agricultural lands exist. The Act's requirements will be followed to mitigate any adverse impacts to these areas. Other location-specific standards are identified in Appendix B.

#### 10.2.3 Action-Specific Requirements

Action-specific requirements are technology-based restrictions triggered by specific types of remedial measures under consideration. Once the remedial action alternatives were developed for Operable Units I and II in the feasibility study, the Environmental Protection Agency and the State of Utah identified action-specific requirements which were applicable or relevant and appropriate to the remedies considered. The Uranium Mill Tailings Radiation Control Act and implementing regulations at 40 CFR 192. and the Occupational Safety and Health Act and implementing regulations at 29 CFR 1910.96 and 1926.58. double as action-specific requirements for the millsite and peripheral properties. Compliance with these regulations was discussed in Section 10.2.1. Appendix B identifies all action-specific requirements which have been identified for the selected remedies for Operable Units I and II.

#### 10.2.4 "To Be Considered" Requirements

In addition to the requirements mentioned above, the Environmental Protection Agency considered other Federal and State criteria, advisories, and guidance in determining the appropriate degree of clean up for the Monticello Mill Tailings Site. The following requirements are not "applicable" or "relevant and appropriate", but have been agreed to by the Department of Energy, Environmental Protection Agency, and the State of Utah as "to be considered" when determined to be pertinent to the clean up at the Monticello Mill Tailings Site. Operable Units I and II.

- Guidance on designing the repository (Uranium Mill Tailings Remedial Action Program research and practice). including the latest revision of the Technical Approach Document:

As discussed above, guidance developed by the Department of Energy and the Nuclear Regulatory Commission to assist in meeting the requirements of 40 CFR 192. Subpart A. will be followed during repository design activities.

- Guidance establishing standards and requirements for the Department of Energy and its contractors with respect to protection of the public health and environment against radiation (Department of Energy Order 5480.1):

As with occupational health and safety standards, Department of Energy requirements for protection of the public and the environment against radiation will be enforced during all remediation activities. Compliance will be monitored appropriately.

- Radiologic protection guidelines (hot-spot criteria) for clean up of residual radioactive material and management of the resultant wastes and residues (U.S. Department of Energy *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program [Revision 2, March 1987]*):

The Department of Energy's hot-spot criteria will be used for both Operable Units I and II when surface or subsurface soil concentrations in a specified area exceed the 40 CFR 192.12 standards by a certain factor. The approach for determining the site-specific hot-spot criteria, referred to above, will be followed.

- "Proposed Standards for Remedial Action at Inactive Uranium Processing Sites with Ground-Water Contamination" (52 FR 36000, September 24, 1987) will replace existing ground-water protection standards at 40 CFR 192.20 (a)(2) and (3). It requires clean up of contamination that occurred before the tailings are stabilized and also requires that tailings be stabilized and controlled in a manner that eliminates or minimizes the contamination of ground water. The proposed standards specify that remedial actions at processing sites will comply with 40 CFR Part 264, Sections 264.93, hazardous constituents, and 264.94, concentration limits. Table 1 in Section 264.93 identifies the constituents and the maximum concentration limits allowable. In addition to those constituents listed in 264.93, the proposed rule includes concentration limits for molybdenum, nitrate, combined radium-226 and radium-228, and combined uranium-234 and uranium-238. The limits for other constituents are set at their background level in ground water at the regulated unit.

During the remedial design phase for Operable Unit I, a monitoring program will be developed to evaluate background concentrations for ground-water compliance purposes and to monitor repository performance with respect to ground-water contamination. The program will assess cell integrity by monitoring compliance with specific ground-water constituents, determined in accordance with the proposed regulations. In accordance with the proposed rule, corrective action would be invoked if noncompliance with the ground-water standards occurs.

### 10.3 COST EFFECTIVENESS

The selected remedy is cost-effective because it has been determined to provide overall effectiveness proportional to its costs. The selected remedy for each operable unit represents the most cost-effective alternative of the alternatives evaluated in the feasibility study, where cost-effectiveness is defined as the reduction in threat to public health and the environment per dollars expended.

The estimated cost of the selected alternative for Operable Unit I (\$42.3 million) is approximately 60 percent of the cost of the off-site disposal alternative, but provides the same level of long-term protection and involves fewer short-term risks. The selected alternatives for Operable Unit II may range in cost from \$12.648 million and \$18.460 million, depending upon the remedial method employed for specific land types.

### 10.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE AND PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The selected remedy does not employ treatment or resource recovery technologies. Although several treatment technologies were evaluated during the process of developing alternatives for the site, most of them were found to be either technically unfeasible or inadequately tested for use with radiologic contaminants under conditions in existence at the site. None of the available treatment technologies would permanently reduce the toxicity of radiologic contaminants by reducing their mass. Treatment technologies that would result in a reduction in volume require handling and disposal of residuals that could present additional health risks to workers or the environment, and were not as cost-effective as the selected alternatives. Treatment technologies that could result in a reduction in mobility were either untested or were not cost-effective.

The selected remedy will reduce human health risks to the maximum extent practicable for the Monticello Mill Tailings Site. with maximum short-term effectiveness. The selected remedy employs well-accepted and easily implementable techniques and would achieve maximum cost-effectiveness.

APPENDIX A  
MONTICELLO MILL TAILINGS SITE  
RESPONSIVENESS SUMMARY

## APPENDIX A

### MONTICELLO MILL TAILINGS SITE (Monticello, Utah) RESPONSIVENESS SUMMARY

#### 1.0 OVERVIEW

This Responsiveness Summary responds to comments received during the public comment period on the Remedial Investigation/Feasibility Study (RI/FS) and Proposed Plan for the U.S. Department of Energy's Monticello (Utah) Mill Tailings Superfund Site remedial action project. It should be noted that reference is often made to this project as the Monticello Remedial Action Project, or MRAP, as it is titled under DOE's Surplus Facilities Management Program. The Monticello Millsite RI/FS and Proposed Plan were available to the public for comment from October 27 through November 25, 1989. The comment period was extended until December 19, 1989 to accommodate additional comments.

At the time of the public comment period, the U.S. Department of Energy (DOE) had proposed preferred alternatives for the three Operable Units (OUs) of the Monticello Remedial Action Project. The proposed preferred remedial action alternative for Operable Unit I (Tailings) would be to remove the approximately 2 million cubic yards of tailings from the millsite, the peripheral properties, and the vicinity properties and relocate them to a designed disposal cell at a site south of their present location.

Based upon the verbal comments received during the public meeting, the residents and City of Monticello have no objections to the proposed preferred alternative for OU I. Written comments received during the public comment period indicate the Umetco Minerals Corporation, Boulden Contracting Company, Rio Algom Mining Corporation, and Ecology and Environment, Inc. prefer the second alternative for OU I, removal of tailings to a licensed repository. However, the State of Utah Bureau of Radiation Control has indicated that current state policy does not allow the disposal of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) materials at Nuclear Regulatory Commission (NRC) disposal sites. Two local ranchers suggested that land currently owned by the government be used instead of purchasing additional private land for the south site location. Written comments from Rio Algom Mining Corporation questioned the cost differences between alternatives 1 and 2 and requested a clarification of those calculations. In addition, the U.S. Environmental Protection Agency Region VIII (EPA) and the State of Utah (State) have submitted written questions regarding engineering design of the preferred alternative for OU I.

The proposed preferred alternative for Operable Unit II (Peripheral Properties) is to use a combination of conventional construction and environmentally sensitive construction methods for clean up to the 40 CFR 192.12 standards depending on the nature of the contamination and the type of land. Supplemental standards (leaving some or all of the contamination in place) could potentially be applied in specific areas where the clean up would cause excessive environmental damage in comparison to the derived environmental and health benefits.

No written concerns were expressed relative to the proposed remedial action for the peripheral properties. One comment expressed at the public meeting by an employee of the City of Monticello requested clarification of the proposed use of supplemental standards at the cemetery.

The Department of Energy's proposed preferred alternative at the time of the public comment period for Operable Unit III (Ground Water) was to remove the source of the contamination (mill tailings) and to allow passive restoration of the ground water. Passive restoration would entail natural flushing of the Alluvial aquifer over a 60-year time period with institutional controls to limit access to ground-water use. The State and EPA submitted written comments regarding the technical aspects of passive restoration.

Written comments from Boulden Contracting Company, the Rio Algom Mining Corporation and Ecology and Environment, Inc. supported more active ground-water treatment methods and a reduction of the time-span for ground-water clean up. The Southeastern Utah District Health Department expressed concern that present and future downstream uses of Montezuma Creek water had not been fully taken into consideration and proposed that the final clean-up plan incorporate a suitable measure of health protection for all present and potential users.

Since this time, EPA, the State of Utah, and DOE, have agreed to evaluate remedial action alternatives for ground water and surface water following completion of remedial action for Operable Units I and II. This approach is presented in the Record of Decision.

More detailed responses to verbal and written comments received during the public comment period appear in Section 3.0, Summary of Comments Received During the Public Comment Period and Agency Responses.

These sections follow:

- Background on Community Involvement.
- Summary of Comments Received During the Public Comment Period and Agency Responses.
- Remaining Concerns, and
- Attachment: Community Relations Activities for the Monticello Millsite Superfund Site.

## 2.0 BACKGROUND ON COMMUNITY INVOLVEMENT

Community relations activities by the U.S. Department of Energy's Grand Junction Projects Office have been ongoing since 1980. A list of community relations activities is included as an attachment to this Responsiveness Summary. Contact has been predominantly through periodic briefings of city and county officials, State of Utah representatives, local media, and individual peripheral property owners. Periodic press releases and fact sheets have been issued and several public meetings have been conducted on Monticello clean-up activities. Community interest in the clean up of the Monticello millsite has been very low with few community concerns expressed.

The low public concern can be accounted for by several factors:

- Local citizens have lived and worked with the uranium mining and milling industry since the early 1940's. Many made their livelihood from those industries.
- Most citizens do not view the mill tailings as a serious health hazard, and the majority of the community is unconcerned about the presence of contamination.
- Interim site stabilization has been in place since 1964. The millsite tailings piles blend into the surrounding terrain and have not been perceived as a hazard or eyesore by local residents. Routine monitoring and maintenance of the millsite tailings has been in place since stabilization.
- Work has been in progress at the Monticello Vicinity Properties for several years and local residents are aware that DOE is in the process of cleaning up the mill tailings in the area.

General community concerns expressed in the past have centered on the following issues:

#### Safety

- Community concerns relating to any type of prolonged mill tailings remedial action construction activity include increased potential for car/truck accidents, and concern that spills could occur that may affect the community and environment along the transportation route. City officials have expressed concern about road damage from truck traffic and the need to provide funding for road upgrading and routine repair.

The proposed preferred alternative for OU I is relocation of the tailings pile out of the Montezuma Creek floodplain to an on-site location south of the present site. Worker commuter traffic to and from the site will increase as will equipment haulage by truck when compared to the normal traffic patterns. These effects would not be expected to present serious inconveniences to the general public. Heaviest movement of equipment during pile relocation would be restricted to the site. An on-site road would be constructed and used during the tailings relocation process, thus eliminating heavy truck traffic on public roadways.

Recently, the Department of Energy agreed to share with the City of Monticello in the repair costs of those roads used by DOE to move tailings from the Vicinity Properties to the millsite for ultimate disposal.

#### Noise/Dust Control

- Some concern has been expressed about noise and dust impacts on properties close to the millsite during remediation.

Noise impacts would most affect on-site workers. Hearing protection will be provided and impacts on neighboring properties should be negligible. Dust control will be exercised during remediation using established methods and procedures.

#### Tourism

- Monticello derives some income from tourist traffic. Potential loss of tourist trade during remedial action is a local concern.

Any economic loss due to decreases in the tourist industry should be minimal and should be at least partially offset by increased income to the community through contractor payrolls, lodging and purchases of goods, etc. DOE estimates that during the multi-year construction period, about 43 jobs will be filled by local residents, with another estimated 83 indirect jobs being created by the project. Furthermore, implementation of the proposed alternative minimizes highway impacts.

### 3.0 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

Comments raised during the Monticello Millsite public comment period on the RI/FS and Proposed Plan are summarized briefly below and agency responses are provided.

#### 3.1 SUMMARY OF QUESTIONS RECEIVED AT THE PUBLIC MEETING ON THE MRAP RI/FS AND PROPOSED PLAN ON NOVEMBER 16, 1989.

The following is a summary of comments received and responses made at the public meeting held in Monticello, Utah, on November 16, 1989. The transcript from the public meeting is located in the Administrative Record in the San Juan County Library and contains all questions asked and full responses made during the meeting.

##### 3.1.1 General Comments

- 1) Several questions asked for clarification of the differences between the Monticello site and Uranium Mill Tailings Remedial Action (UMTRA) sites.

DOE RESPONSE: Unlike UMTRA sites, the Monticello millsite was owned and operated by DOE. Therefore, it cannot be remediated under DOE's UMTRA Program. Unlike UMTRA projects, the State does not share costs on the millsite project. DOE is the principal responsible party and bears clean-up costs.

- 2) The local public and local contractors were interested in whether the project can be broken down into smaller units so that local contractors may bid on remediation activities.

DOE RESPONSE: Certain phases of the clean-up activities can be broken down into smaller units, such as peripheral properties remediation and site preparation activities. There will be many instances where local contractors will be in a good position to provide contracting services.

- 3) At the public meeting a request was made by the Rio Algom Mining Corporation to extend the public comment period to January 5, 1990.

DOE RESPONSE: DOE was unable to respond to this question during the public meeting because the decision was EPA's responsibility. Therefore, a response is now provided.

The public comment period started with the release of the RI/FS and Proposed Plan on October 27, 1989. On that date, the RI/FS and the Proposed Plan were placed in the Administrative Record at the Information Repository locations. Additional copies were sent to key contacts. Two Notices of Opportunity to Comment were published in the San Juan Record. On November 16, 1989, DOE, EPA, and the State held a public meeting in Monticello to receive any comments on the two documents. The comment period initially allowed four weeks for comment and was scheduled to end on November 25, 1989, but was extended to accommodate additional comments. With the extension, which was agreed to by EPA and the State, the comment period ended on December 19, 1989. Rio Algom Mining was also informed by EPA that any written comments by the company would be accepted following the close of the public comment period. Rio Algom submitted comments on December 1, 1989.

- 4) Several questions related to the overall cost of the millsite project and to the length of time that the project has been "studied".

DOE RESPONSE: Currently, under DOE's five-year plan which prioritized clean-up activities and associated funding, the Monticello Mill Tailings Site is a "priority one" site. The current cost estimate of approximately \$65 million for clean up of the millsite includes Federal Facility Agreement development, RI/FS, NEPA documentation, etc., as well as remedial design and remedial action.

### 3.1.2 Operable Unit I - Monticello Millsite

- 1) A local resident asked whether DOE would retain ownership of the millsite area following remediation.

DOE RESPONSE: The site will have to be verified as being clean and must be de-listed from the National Priority List prior to being released by the Federal government for private use or ownership.

- 2) Many questions were asked regarding the proposed South Site remedial action alternative, including cap design, physical location of the repository, slope considerations, physical security, etc.

DOE RESPONSE: General details regarding repository design have been identified in the Monticello millsite RI/FS and were reviewed at the public meeting. Specific details of repository design, physical location, security measures, etc., will be determined during remedial design. Community relations activities to be performed during remedial design include issuing fact sheets and providing a public briefing following final design.

- 3) The mayor asked what ramifications would occur if the City expanded. Related questions involved how close development could come to the final repository and whether the proposed repository site is within current City limits.

DOE RESPONSE: The proposed repository site is not within City limits. Repository design will include concern for aesthetics to the surrounding community. The acceptable distance (or buffer zone) needed between the repository and the local community will vary according to land use. Commercial or industrial use could be allowed to take place closer to the repository than residential dwellings. Specific answers will be developed during remedial design.

- 4) The representative of an engineering firm asked whether the same disposal standards would apply to the tailings if hauled to a currently licensed facility.

DOE/STATE OF UTAH RESPONSE: The State responded that current policy allows no CERCLA waste to be disposed of with wastes at NRC-licensed facilities. Barring State policy, the same disposal standards would apply. The State of Utah Bureau of Radiation Protection would take the lead on issues regarding disposal standards.

### 3.1.3 Operable Unit II - Peripheral Properties

- 1) A representative from the Southeastern Utah District Health Department asked for examples of supplemental standards usage.

DOE RESPONSE: One area where supplemental standards have been used traditionally is for utility lines under pavement and sidewalk. They have also been proposed for cemeteries.

- 2) Several questions were raised regarding the proposed use of supplemental standards at the cemetery in Monticello.

DOE RESPONSE: The use of supplemental standards, as described in 40 CFR 192, may be proposed for the cemetery. Prior to a decision being made to leave the tailings in place under the supplemental standards provision, DOE will prepare a detailed document for State and EPA review and concurrence which evaluates any impact to human health and the environment.

- 3) A Monticello resident asked whether the golf course in Monticello is contaminated.

DOE RESPONSE: The answer given at the public meeting was that the golf course is not contaminated. This is in error. The golf course is contaminated with mill tailings and will be remediated under the Monticello Vicinity Properties project.

#### 3.1.4 Operable Unit III - Ground Water

A summary of questions from the meeting and agency responses follows. It should be noted, however, that DOE has agreed with EPA/and the State to postpone evaluation of the ground water and surface water until after remediation of the millsite and peripheral properties. Therefore, answers to questions regarding potential ground-water remedial action alternatives are provided, but a focused Remedial Investigation/Feasibility Study and Record of Decision will follow at a later date to determine the appropriate remedial action.

- 1) A local resident asked about the duration of passive restoration and how clean the ground water will be at that point in time.

DOE RESPONSE: Modeling done for the millsite indicates that if passive restoration of the ground water is chosen as an alternative for ground-water remediation, approximately 60 years would be needed to reduce the contaminants in the alluvial aquifer to acceptable levels, based on current levels of contamination.

- 2) Several questions were asked regarding how far the ground-water plume has traveled and how far it will travel in sixty years.

DOE RESPONSE: Since several written comments were also received on the issue, DOE's response is found in Section 3.3 of this Appendix, on page A-15.

#### 3.2 WRITTEN COMMENTS RECEIVED ON THE CERCLA PROCESS

- 1) EPA requested additional information regarding why all but one of the off-site alternatives was eliminated during the preliminary screening process.

DOE RESPONSE: The preliminary screening process involved evaluating each potential repository location with respect to effectiveness, implementability, and cost. The evaluation also included an evaluation of compliance with the major action-specific ARAR, 40 CFR 192, "Standards for Remedial Actions at Inactive Uranium Processing Sites". Based on this ARAR, 25 siting criteria were established and each potential site was evaluated against the criteria.

Seven potential off-site repository locations within 12 to 45 miles of the site were evaluated during the preliminary screening process. Based on the screening process, the Highway 95 site was selected as the most suitable of these sites and was kept for further study in the FS. This location was ultimately eliminated during the detailed

analysis of alternatives because of relatively high cost and concerns with implementability. The other six sites exhibited substantially higher potentials for wind and water erosion, flooding, and landslides. Design longevity questions, ground-water concerns, and endangered species considerations also were reasons for dropping the other six sites. All potential off-site locations required transport of contaminated materials for various distances on public roads.

- 2) The State requested that a site-specific health and safety plan be developed.

DOE RESPONSE: This activity is scheduled to be performed during the design phase of the project and will be completed prior to performing field work.

- 3) The State and EPA made numerous editorial comments and technically-oriented substantive comments on the draft final MRAP RI/FS and Proposed Plan.

DOE RESPONSE: Editorial and grammatical comments on the RI/FS are incorporated in the final MRAP RI/FS by the addition of errata sheets. Neither editorial nor grammatical comments on the Proposed Plan were incorporated since the Proposed Plan served its one-time purpose during the public review and comment period.

Substantive technical comments made on the RI/FS and Proposed Plan are responded to in this Responsiveness Summary and in addition, have been incorporated into the Record of Decision.

- 4) The EPA and State had several comments regarding Applicable or Relevant and Appropriate Requirements (ARARs). EPA clarified the appropriateness of RCRA as an ARAR by stating that 40 CFR 192. (the predominant relevant and appropriate regulation for the Monticello millsite cleanup) and proposed amendments "... provide sufficient protective conditions to make the determination that additional RCRA Subtitle C regulations are neither relevant or appropriate...". The State noted several additions to the list of ARARs currently defined for the project.

DOE RESPONSE: Under CERCLA, ARARs identification is termed an iterative process. Based on the promulgation and identification of several new State laws, and resolution of the RCRA issue, it is appropriate that a final list of ARARs be included in the Record of Decision. No ARARs discussions were modified in the draft MRAP RI/FS in response to these comments. However, an errata was added that refers to the ARARs table in the Record of Decision, Appendix B.

- 5) The EPA commented that several MRAP FS appendices make reference to two preliminary remedial action alternatives, one involving slurry walls within the aquifer, and one consisting of stabilization in place for the mill tailings.

DOE RESPONSE: The FS appendices were prepared prior to the knowledge of proposed changes to 40 CFR 192, which address ground-water quality at mill tailings sites. The two preliminary alternatives discussed in the appendices were dropped from consideration as remedial action alternatives in the FS for this reason. However, these appendices still contain relevant information for the remedial action alternatives identified in the FS and remain as originally written.

### 3.3 WRITTEN TECHNICAL QUESTIONS/CONCERNS RECEIVED REGARDING REMEDIAL ALTERNATIVES

- 1) EPA and the State have made several comments on the design for the preferred alternative (removal and disposal on-site, south of the present site). These include location of the repository and repository design.

DOE RESPONSE: DOE is in agreement with both the State and EPA that the entire south area, comprising the near South Site and far South Site, should be identified as the repository area (see Figure 9-1). This clarification has been incorporated into the ROD and will allow flexibility in the design process to site the repository in an ideal position based on further investigation of the site. As recommended by EPA, DOE has expanded its current geotechnical investigation to identify the design constraints posed by topography, geology, and ground-water conditions. The existing drilling investigations will include a ground-water study and analysis which will provide sufficient data to identify the piezometric surface both in the alluvium (pediment gravels) and in the underlying Mancos Shale. Based on these findings, a determination will be made as to whether the near South Site is an acceptable repository site that provides protection of human health and the environment. If the near South Site is determined to be unacceptable to the State and EPA, the repository will be located on the far South Site. Both the State and EPA consider this design approach for on-site remedial action as appropriate.

DOE is in agreement with EPA and the State on the principle that the repository must be designed and constructed to comply with 40 CFR Part 192, Title I design criteria. This design must be based on comprehensive studies of the tailings and repository site characteristics. These studies are either currently in progress or are scheduled during the design phase. The primary design guidance is the UMTRA Technical Approach Document (TAD) which includes the latest acceptable repository design approach. The preliminary design presented in the FS is based on the TAD, other UMTRA research, and DOE/NRC research for long-term repositories with up to a 1,000-year life. A mutually acceptable design will be agreed to, once the design review process is initiated. It is also recognized that new information will be forthcoming in revised TADs that will also change the design concept of the repository. The final repository design will be based on the latest research and experience available, and will be approved by the State and EPA.

- 2) EPA and the State made several comments regarding the selection and effectiveness of passive restoration of the ground water.

DOE RESPONSE: DOE agrees with EPA and the State that the Proposed Plan provides for the ground-water contamination to be cleaned up in accordance with 40 CFR Part 192. Some active ground-water treatment measures would initially be employed during the tailings (source) removal activities to de-water tailings. Activities to be implemented prior to mill tailings remediation involve implementing institutional controls (consisting of buying or leasing water rights, for example) to restrict any potential public use of the ground water and implementation of a monitoring program to evaluate changes in ground-water contamination as a result of tailings removal.

Throughout construction of Operable Units I/II, a ground-water monitoring program of the Alluvial and Burro Canyon aquifers will be conducted. This monitoring program will continue for three years after removal of the contaminated material. As monitoring continues during the three year period, DOE, EPA, and the State will periodically review the results of the monitoring data and determine what additional steps, if any, will be required to complete aquifer restoration. When sufficient data has been gathered to warrant a final decision for ground-water restoration, a Record of Decision will be produced for Operable Unit III.

- 3) Various comments were received from EPA, the State of Utah, two nearby NRC-licensed millsites, and construction and consulting firms pertaining to the cost comparisons and design requirements for the various alternatives.

DOE RESPONSE: The cost estimates and design requirements presented in the RI/FS were developed utilizing consistent criteria for regulatory considerations, technical design, DOE subcontracting, and procurement practices. Some of the specific questions raised include:

- 3a) Why the cost savings associated with placing the tailings into existing NRC-licensed disposal sites was not utilized for the off-site disposal alternative.

There are several significant problems with disposing of these CERCLA materials in an NRC-licensed millsite.

- State of Utah policy prohibits the disposal of CERCLA material at an NRC-licensed millsite.
- The MRAP repository design must comply with UMTRCA Title I requirements for inactive millsites. Title II requirements for licensed millsites do not necessarily fulfill all Title I requirements for the 200- to 1,000-year repository design life.
- DOE would be unwilling, given the perpetual legal liabilities for CERCLA materials, to co-dispose the Monticello tailings with any other millsite materials that may have pre-existing site releases or design inadequacies. The only feasible off-site alternative from a liability standpoint would be to construct a separate repository cell complying with Title I requirements for the CERCLA materials.

- 3b) DOE was asked why the cost estimates seemed to be much higher than commercial practice for uranium millsite remediation.

These estimates are based upon R.S. Means data, incorporating the requirements for CERCLA and DOE quality assurance and environmental, health, and safety standards. In addition, DOE requires all subcontracted activities to comply with Davis-Bacon wage rates. Specific questions and responses are detailed below.

- 3c) According to the Superfund guidance as stated on page 4-8 of the Feasibility Study, inflation must be taken into account before present worth analysis can be performed. In the cost estimates, the costs are expressed in 1989 dollars and are allocated to the year in which they occur without taking into account inflation. It appears that the costs are then discounted. If inflation has not been incorporated in the analysis, please make the appropriate changes to include inflation or justify why inflation was neglected.

According to the March 1988 Superfund guidance, a discount rate of 5 percent before taxes and after inflation should be assumed. This discount rate takes into account inflation. If all costs were inflated, a higher discount rate would have been used. Regardless of which approach is used, the net result of the ranking of alternatives by cost would not change.

- 3d) In the cost estimates, some years appear to have two operating costs. For example on page F-23 of the FS report, the year 1996 has a cost of \$250,000 and \$42,000. Please explain this apparent inconsistency.

Environmental monitoring at an operating cost of \$250,000 per year begins in 1990 and is completed by the end of 1995 (beginning of 1996). Ground-water monitoring at an operating cost of \$42,000 per year begins in 1996 and is completed by the end of 2019 (start of 2020). The year 1996 has only one operating cost of \$42,000.

- 3e) Some of the present worth calculations cannot be reproduced. For example, the operating and maintenance costs on page F-23 of the FS report. Please make any necessary corrections.

The present worth calculations have been recalculated. While the capital costs are the same, there are some minor changes in the operating and maintenance costs. None of the changes in cost change the overall ranking of alternatives. Table A3-1 shows correct calculations of present worth.

- 3f) Please explain why the specified percentages were chosen for the indirect costs and the contingencies.

The percentages for indirect costs are based on currently utilized cost data for other construction projects administered for the Department of Energy. The percentage for contingencies is typical for alternatives in a preliminary or conceptual phase.

- 3g) Please explain why labor, materials, equipment, and potential subcontracting items should all be allocated the same overhead percentage.

Table A3.1. Present Worth Calculations  
for the Monticello Millsite  
Project

THIS TABLE WILL CALCULATE PRESENT WORTH VALUES WHEN GIVEN;  
DISCOUNT RATE (%), CAPITAL COSTS AND O&M COSTS IN THE YEAR  
OF EXPENDITURE

PROJECT: OPERABLE UNIT I, Alternative 3

PRESENT WORTH CALCULATION TABLE  
DOLLARS IN \$1000

i= 5 % START DATE 1989  
t= 31 years END DATE 2019

PRESENT WORTH = \$42,346,398

	A YEAR COST OCCURS	B CAPITAL COST	C O&M COSTS	D ANNUAL EXPENDITURES B+C	E DISCOUNT FACTORS* $(1/(1+i)^t)$	F PRESENT WORTH D*E
0	1989			0	1.000	\$0
1	1990			0	0.952	\$0
2	1991			0	0.907	\$0
3	1992	13035000		13035000	0.864	\$11,260,123
4	1993	13035000		13035000	0.823	\$10,723,927
5	1994	13035000		13035000	0.784	\$10,213,264
6	1995	13035000		13035000	0.746	\$9,726,918
7	1996		41000	41000	0.711	\$29,138
8	1997		41000	41000	0.677	\$27,750
9	1998		41000	41000	0.645	\$26,429
10	1999		41000	41000	0.614	\$25,170
11	2000		41000	41000	0.585	\$23,972
12	2001		41000	41000	0.557	\$22,830
13	2002		41000	41000	0.530	\$21,743
14	2003		41000	41000	0.505	\$20,708
15	2004		41000	41000	0.481	\$19,722
16	2005		41000	41000	0.458	\$18,783
17	2006		41000	41000	0.436	\$17,888
18	2007		41000	41000	0.416	\$17,036
19	2008		41000	41000	0.396	\$16,225
20	2009		41000	41000	0.377	\$15,452
21	2010		41000	41000	0.359	\$14,717
22	2011		41000	41000	0.342	\$14,016
23	2012		41000	41000	0.326	\$13,348
24	2013		41000	41000	0.310	\$12,713
25	2014		41000	41000	0.295	\$12,107
26	2015		41000	41000	0.281	\$11,531
27	2016		41000	41000	0.268	\$10,982
28	2017		41000	41000	0.255	\$10,459
29	2018		41000	41000	0.243	\$9,961
30	2019		41000	41000	0.231	\$9,486

\$42,346,398

Table A3.1. continued

THIS TABLE WILL CALCULATE PRESENT WORTH VALUES WHEN GIVEN:  
DISCOUNT RATE (%), CAPITAL COSTS AND O&M COSTS IN THE YEAR  
OF EXPENDITURE

PROJECT: OPERABLE UNIT 1, Alternative 2

## PRESENT WORTH CALCULATION TABLE

i= 5 %                      START DATE                      1989  
t= 31 years                  END DATE                      2019

PRESENT WORTH = \$69,893,850

	A YEAR COST OCCURS	B CAPITAL COST	C O&M COSTS	D ANNUAL EXPENDITURES B+C	E DISCOUNT FACTORS* $(1/(1+i)^t)$	F PRESENT WORTH D*B
0	1989			0	1.000	\$0
1	1990			0	0.952	\$0
2	1991			0	0.907	\$0
3	1992	21600000		21600000	0.864	\$18,658,892
4	1993	21600000		21600000	0.823	\$17,770,373
5	1994	21600000		21600000	0.784	\$16,924,163
6	1995	21600000		21600000	0.746	\$16,118,233
7	1996		41000	41000	0.711	\$29,138
8	1997		41000	41000	0.677	\$27,730
9	1998		41000	41000	0.643	\$26,429
10	1999		41000	41000	0.614	\$25,170
11	2000		41000	41000	0.585	\$23,972
12	2001		41000	41000	0.557	\$22,830
13	2002		41000	41000	0.530	\$21,743
14	2003		41000	41000	0.503	\$20,708
15	2004		41000	41000	0.481	\$19,722
16	2005		41000	41000	0.458	\$18,783
17	2006		41000	41000	0.436	\$17,888
18	2007		41000	41000	0.416	\$17,036
19	2008		41000	41000	0.396	\$16,225
20	2009		41000	41000	0.377	\$15,452
21	2010		41000	41000	0.359	\$14,717
22	2011		41000	41000	0.342	\$14,016
23	2012		41000	41000	0.326	\$13,348
24	2013		41000	41000	0.310	\$12,713
25	2014		41000	41000	0.295	\$12,107
26	2015		41000	41000	0.281	\$11,531
27	2016		41000	41000	0.268	\$10,982
28	2017		41000	41000	0.255	\$10,459
29	2018		41000	41000	0.243	\$9,961
30	2019		41000	41000	0.231	\$9,486

\$69,893,850

R.S. Means, which is a primary data source of construction costs, breaks costs into labor, equipment, and material. The unit costs shown in the cost estimates consist of the total of labor, equipment, and material with overhead percentages determined by R.S. Means data. For our purposes, the cost estimates are to be in the +50 to -30 percent range. Unit costs are the level of detail required.

- 3h) The costs for hauling tailings to an alternate site would most likely be a subcontract, and it is not apparent why they should be subject to the same indirect and overhead costs. Similarly, the costs for hauling clean material for the restoration of Montezuma Creek floodplain do not recognize the obvious economies of scale resulting from the trucks returning empty from the receiving repository.

For the level of effort required, all construction costs were burdened by the same indirect and overhead costs. There is no need to break the construction costs out by subcontracts. The indirect and overhead costs would change by an insignificant amount. There may be some savings by hauling clean backfill back to Montezuma Creek, but because of all the unknowns (e.g., truck decontamination needs, suitability and location of fill material, etc.) the conservative approach was taken.

- 4) Several comments were received regarding the methods and time required for active ground-water treatment and whether downstream impacts had been fully considered.

DOE RESPONSE: Throughout construction of Operable Units I/II, a ground-water monitoring program of the alluvial and Burro Canyon aquifers and Montezuma Creek will be conducted. This monitoring program will continue for three years after removal of the contaminated material. As monitoring continues during the three year period, DOE, EPA, and the State of Utah will periodically review the results of the monitoring data and determine what additional steps, if any, will be required to complete aquifer- and surface-water restoration. When sufficient data has been gathered to warrant a final decision for restoration, a Record of Decision will be prepared for Operable Unit III.

Institutional controls may be implemented prior to remediation of Operable Units I and II. These controls will be maintained until the aquifer is in compliance with the prevailing standards.

Although there are traces of contamination found downstream in the Montezuma Canyon area of Montezuma Creek, constituents do not exceed water-quality standards to the nearest water user downstream of the canyon.

#### 4.0 REMAINING CONCERNS

All written and oral public concerns were addressed at the public meetings and/or within this Responsiveness Summary. Written comments received from the EPA and the State during the public comment period have been addressed in this Responsiveness Summary and incorporated into the Record of Decision, or added as errata to the Final MRAP RI/FS. There are no remaining concerns left unaddressed.

ATTACHMENT TO APPENDIX A

COMMUNITY RELATIONS ACTIVITIES  
FOR THE MONTICELLO MILL TAILINGS  
SUPERFUND SITE  
January 1990

Community relations activities conducted on behalf of the Monticello Mill Tailings Superfund Site to date have included the following:

- Site visits and meetings between the DOE, the Remedial Action Contractor (RAC), the Monticello City Manager, San Juan County Commissioners, State of Utah representatives, and individual property owners. (1980)
- News releases on the beginning of the vicinity property cleanup program and the results of generalized radiologic assessments and survey activities. (1980)
- General information briefings by DOE to the local news media, Utah State Bureau of Radiation and Occupational Health, and the S.E. Utah District Health Department.
- Issued a fact sheet on the Monticello Uranium Mill tailings. (1982)
- Maintained close contact with the State of Utah Governor, State Division of Environmental Health, and State Department of Natural Resources and Energy. (1982)
- Participated in San Juan County Board of Commissioners meeting to provide an update on the DOE's Surplus Facilities Management Program (SFMP) plan for Monticello clean up. (1982)
- Maintained ongoing communications with city and county officials. (1983)
- Met with State officials and the San Juan County Board of Commissioners to discuss continuation of the Monticello Millsite (MRAP) and Vicinity Properties (MVP) programs and to outline program milestones. (1984)
- Worked with the *San Juan Record* on a major article summarizing clean-up activities during 1985, including the Superfund clean-up program. (1986)
- Conducted community interviews with local officials and affected residents. (1986)
- Prepared a draft community relations plan. (May 1987)
- Maintained ongoing discussions between EPA, DOE, the State, San Juan County, and the City of Monticello during the negotiation of the Federal Facilities Agreement. (1988)

- Issued a press release announcing a public meeting to discuss the Federal Facilities Agreement (FFA). A public comment period from February 9 through February 20, 1989 was provided. (January 27, 1989)
- Conducted a Health and Safety training workshop for those involved in the Monticello Vicinity Properties clean up. Included in the training were representatives from the State of Utah and the City of Monticello. (March 1989)
- Established an Information Repository and the Administrative Record at the San Juan County Library. (June 28, 1989)
- Conducted special briefings for the Monticello City Council and the San Juan County Commissioners on the DOE 5-Year Environmental Restoration and Waste Management Plan. (October & November 1989)
- Provided public review copies of the RI/FS and Proposed Plan for the Monticello Millsite to the Administrative Record and Information Repository locations. (October 27, 1989)
- Developed and distributed a 5-page information update on the MRAP Superfund site. (November 1989)
- Published two Notices of Opportunity to Comment in the local newspaper. A public comment period from October 27 through November 25, 1989 was provided. (October 25 and November 15, 1989)
- Conducted a public meeting in Monticello on November 16, 1989 to describe the work plan contents and to respond to questions. Twenty-eight people attended, including the Monticello mayor, city manager, representatives from the City Council, a representative for U.S. Senator Jake Garn and U.S. Representative Howard Nielson, the San Juan County District sanitarian, representatives from the State of Utah Department of Health, and members of the public. A transcript of the meeting, including all questions and answers, is available as part of the Administrative Record at the San Juan County Library. (November 1989)
- Issued a press release on the addition of the Monticello site to the Superfund National Priority List (NPL). (November 1989)

APPENDIX B  
FEDERAL AND STATE OF UTAH  
APPLICABLE OR RELEVANT AND  
APPROPRIATE REQUIREMENTS

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FEDERAL AND STATE OF UTAH APPLICABLE OR  
RELEVANT AND APPROPRIATE REQUIREMENTS

The following applicable or relevant and appropriate requirements for Operable Units I and II have been identified. Applicable or relevant and appropriate requirements for the remediation of Operable Unit III will be defined during development of the ground-water and surface-water Record of Decision.

The regulations affecting radioactive materials as promulgated in 40 CFR Part 192 and as proposed in the "Standards for Remedial Actions at Inactive Uranium Processing Sites with Ground-Water Contamination" (52 FR 36000, September 24, 1987), are appropriate to the specific characteristics of radioactive materials that exist at the site. Review and analysis of the major provisions within 40 CFR Part 192 indicate that they are functionally equivalent to and are more protective than potentially "relevant and appropriate" nonradioactive hazardous waste requirements of the Resource Conservation and Recovery Act, Subtitle C. The technological standards presently incorporated into 40 CFR Part 192 and the proposed rule, "Standards for Remedial Actions at Inactive Uranium Processing Sites with Ground-Water Contamination" provide sufficient protective conditions to make the determination that additional Resource Conservation and Recovery Act, Subtitle C, regulations are neither "relevant or appropriate," provided that the Department of Energy continues to incorporate the provisions of the proposed rule in the remedial action of the Monticello millsite.

If hazardous wastes are encountered on site, they shall be remediated and disposed of in accordance with the Resource Conservation and Recovery Act and any other applicable regulations.

Table B-1. Applicable or Relevant and Appropriate Requirements (ARARs):  
Federal Standards, Criteria, and Limitations

Standard, Requirement, Criteria, or Limitation	Citation	Description	Status	Comment
Safe Drinking Water Act	42 USC 300g			
National Primary Drinking Water Standards	40 CFR Part 141	Establishes health-based standards for public water systems (maximum contaminant levels).	Neither applicable nor relevant and appropriate for OUI and OUII.	May be an ARAR for OUIII ground and surface water.
National Secondary Drinking Water Standards	40 CFR Part 143	Establishes welfare-based standards for public water systems (secondary maximum contaminant levels).	Neither applicable nor relevant and appropriate for OUI and OUII.	May be an ARAR for OUIII ground and surface water.
Clean Water Act	33 USC 1251-1376			
Water Quality Criteria	40 CFR Part 131 Quality Criteria for Water, 1986	Sets criteria for states to set water quality standards based on toxicity to aquatic organisms and human health.	Applicable (chemical-specific)	See Title 26, Chapter 11, U.C.A. (State of Utah).
Dredge or Fill Requirements (Section 404)	40 CFR Parts 230, 231; 33 CFR Part 323	Requires permits for discharge of dredged or fill material into navigable waters.	Applicable (location-specific) for both OUI and OUII.	Discharge of dredged or fill material into navigable waters or wetlands may occur during construction and remedial action on Montezuma Creek.
Clean Air Act	42 USC 7401-7462			
National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	Establishes standards for ambient air quality to protect public health and welfare (includes standards for particulate matter and lead).	Applicable (contaminant-specific)	Federal standards are applicable, but are implemented through the air program of the State of Utah. See Title 26, Chapter 13, U.C.A.

Table B-1 (continued). Applicable or Relevant and Appropriate Requirements (ARARs):  
Federal Standards, Criteria, and Limitations

Standard, Requirement, Criteria, or Limitation	Citation	Description	Status	Comment
National Emission Standards for Radon Emissions from Department of Energy Facilities	40 CFR Part 61 Subpart Q	Standards for the design and operation of all storage and disposal facilities for radium-containing materials.	Applicable (chemical-specific) for OUI. Relevant and appropriate (contaminant-specific) for OUII.	
Resource Conservation and Recovery Act (RCRA)	42 U.S.C. 6901 40 CFR Parts 260-280	RCRA requirements for treatment, storage, or disposal of hazardous waste apply to a Superfund site if the site contains RCRA listed or characteristic hazardous waste that was treated or disposed of after the effective date of the RCRA regulations that are under consideration as potential ARARs for the site, or if the CERCLA activity at the site constitutes current treatment, storage, or disposal of RCRA hazardous waste.	Neither applicable nor relevant and appropriate for OUI and OUII.	Characterization at the Monticello mill tailings site shows that no RCRA listed or characteristic hazardous waste was treated or disposed of at the site and no treatment, storage, or disposal of a RCRA hazardous waste is taking or has taken place. Should nonexempt waste be discovered on site during remedial actions RCRA may be an ARAR.
Uranium Mill Tailings Radiation Control Act	42 USC 2022. 42 USC 7901-7942 40 CFR Part 192	Establishes health-based standards for control of residual radioactive materials from inactive uranium processing sites and health-based standards for clean up of lands and buildings having radioactive materials from inactive uranium processing sites.	Relevant and appropriate (action-specific and contaminant-specific) for OUI and OUII.	Also establishes supplemental standards for performing remedial actions that come as close to meeting the otherwise applicable standard as is reasonable under the circumstances.

Table B-1 (continued). Applicable or Relevant and Appropriate Requirements (ARARs):  
Federal Standards, Criteria, and Limitations

Standard, Requirement, Criteria, or Limitation	Citation	Description	Status	Comment
Occupational Safety and Health Act	29 USC 651-678 29 CFR 1910.96 29 CFR 1926.58	Regulates worker health and safety.	Applicable (action-specific and contaminant- specific) for OUI and OUII.	Under 40 CFR 300.38, requirements of this Act apply to all response activities under the NCP. These requirements incorporate the radiation exposure limits of 40 CFR Part 20. The asbestos health standards are also addressed by this Act. Implemented by Utah Law, Title 35, Chapter 9, U.C.A.: R500, U.A.C.
National Historic Preser- vation Act	16 USC 470 40 CFR 6.301(b)	Requires Federal agencies to take into account the effect of any Federally assisted undertaking or licensing on a structure or object that is included on or eligible for the National Register of Historic Places.	Applicable (location- specific) for OUII.	Applicable for OUIII ground and surface water.
Archaeological and Historic Preservation Act	16 USC 469 40 CFR 6.301(c)	Establishes procedures to provide for preservation of historical and archaeological data which might be destroyed through alteration of terrain as a result of a Federal con- struction project or a Federally licensed activity or program.	Applicable (location- specific) for OUI.	Applicable for OUIII ground and surface water.
Fish and Wildlife Coordination Act	16 USC 661-666 40 CFR 6.302(g)	Requires consultation when a Federal department or agency proposes or authorizes any modification of any stream or other water body; requires adequate provisions for protec- tion of fish and wildlife resources.	Relevant and appropriate (location- specific) for OUI.	Modification of Montezuma Creek channel during construction may result in temporary habitat loss for fish and wildlife species.

Table B-1 (continued). Applicable or Relevant and Appropriate Requirements (ARARs):  
Federal Standards, Criteria, and Limitations

Standard, Requirement, Criteria, or Limitation	Citation	Description	Status	Comment
Endangered Species Act	16 USC 1531-1543 50 CFR Parts 17, 402 40 CFR 6.302 (h)	Requires that Federal agencies ensure that any action authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify critical habitat.	Neither applicable or relevant and appropriate for OUI and OUII.	Threatened or endangered species or critical habitat are not present in OUI or OUII. Potentially applicable for OUIII.
Farmland Protection Policy Act	7 USC 4201 7 CFR Part 658	Standards and criteria for identifying and taking into account adverse effects of an agency's actions on significant and important agricultural lands.	Applicable (location-specific) for OUI and OUII.	The U.S. Soil Conservation Service has determined that the proposed repository area is not prime, unique or important farmland. Potentially applicable to OUIII.
Standards for Protection Against Radiation	10 CFR Part 61	Standards for worker health and safety with regard to radiation exposure levels.	Applicable (action-specific and contaminant-specific) for both OUI and OUII.	The requirements of the Federal Occupational Safety and Health Act are implemented by Utah Law, Title 35, Chapter 9, U.C.A.; R500, U.A.C. including the radiation exposure levels.
Statement of Procedures on Floodplain Management	40 CFR Part 6 Appendix M	Establishes agency policy and guidance for carrying out the provisions of Executive Orders 11988 "Floodplain Management" and 11990 "Protection of Wetlands."	Applicable (location-specific) for OUI and OUII.	

Table B-2. Applicable or Relevant and Appropriate Requirements (ARARs):  
State of Utah Standards, Criteria, and Limitations

Standard, Requirement, Criteria, or Limitation	Citation	Description	Status	Comment
Procedures for licensing well drillers and water well drilling standards -- standards for drilling, construction, and abandonment of wells.	73-3-25, U.C.A. R625-4, U.A.C.	Performance standards for casing joints, requirements for abandoning water wells.	Applicable (action-specific) to OUI.	Division of Water Rights governs. Applies to repository monitoring wells and abandonment of millsite wells.
Relocation of Natural Streams -- procedures and standards governing rechanneling of stream beds.	73-3-29, U.C.A. R625-5, U.A.C.	Regulates activities involving the State's natural streams.	Applicable to OUI (action- and location-specific).	Division of Water Rights governs. Applies to diversion of Montezuma Creek during millsite remediation. Relocation of Natural Streams -- procedures and standards governing rechanneling of stream beds.
Protection of Archaeological, Anthropological, Paleontological, Historic, and Cultural Resources	Title 63, Chapter 18, U.C.A. R224, U.A.C.	Utah Code Annotated, Section 63-18-18 declares a legislative interest in the preservation of archaeological, anthropological, and paleontological resources. The purpose of the Act is to preserve these resources for the general welfare of the public. The statutes and rules require a review by the Division of State History prior to disturbing state lands which may effect archaeological, anthropological, paleontological, historic, and cultural sites.	Applicable to OUI and II (location-specific).	Division of State History governs. Applies to remedial actions on any undisturbed lands.
Utah Occupational Safety and Health Standards	Title 35, Chapter 9, U.C.A.: R500, U.A.C.	Utah Code Annotated, Section 35-9-1 is entitled the Utah Occupational Safety and Health Act. Implements, establishes, and enforces occupational health and safety standards similar to the Federal OSHA regulations. Incorporates radiation exposure limits promulgated at 10 CFR 20.	Applicable to OUI and II (action-specific).	Industrial Commission governs.
Definitions for Water Pollution Rules and General Requirements	Title 26, Chapter 11, U.C.A.: R448-1, U.A.C.	This statute and rules set forth the definitions and general requirements for Title 26, Chapter 11, U.C.A., R448-2, 6, and 8, U.A.C.	Applicable to OUI and OUII.	Division of Environmental Health governs.

Table B-2 (continued). Applicable or Relevant and Appropriate Requirements (ARARs):  
State of Utah Standards, Criteria, and Limitations

Standard, Requirement, Criteria, or Limitation	Citation	Description	Status	Comment
Standards for Quality for Water of the State	Title 26, Chapter 11, U.C.A.: R448-2, U.A.C.	These rules are specific to Utah waters, though they are derived in part by using Federal criteria. See particularly the non-degradation policy R448-2-3.	Applicable to OUI and OUII (contaminant-specific).	Division of Environmental Health governs.
Ground Water Protection	Title 26, Chapter 11, U.C.A.: R448-6, U.A.C.	The Bureau of Water Pollution Control, in cooperation with other bureaus in the Division, has promulgated ground-water protection standards. There is no corresponding federal program.	Applicable to OUI (action-specific).	Division of Environmental Health governs.
Utah Pollution Discharge Elimination System	Title 26, Chapter 11, U.C.A.: R448-8, U.A.C.	The Bureau of Water Pollution Control, in cooperation with other bureaus in the Division, has promulgated standards for surface and underground discharges of water; compatible with the Federal regulation adopted pursuant to the Clean Water Act.	Applicable to OUI (action-specific).	Division of Environmental Health governs. Applicable to any discharge to Montezuma Creek.
Utah Air Conservation Act and Rules	Title 26, Chapter 13, U.C.A.: R446-1, U.A.C.	These rules are substantively similar to corresponding federal regulation, with the following exceptions: R446-1-1.25, and R446-1-3.1.8, which require application of best available control technology for any source; R446-1-3.11, which lists criteria to be considered in establishing visibility standards; R446-1-4.1, which sets visible emission standards; R446-1-4.5, which regulates fugitive dust emissions; and R446-1-5.1, which allows the State to require temporary closure of air pollution sources in the event of an air pollution emergency episode. These rules are applicable specifically regarding fugitive dust emission from remedial action activities.	Applicable to OUI and OUII (action-specific).	Division of Environmental Health governs. Applicable to fugitive dust emissions from remediation activities.

Table B-2 (continued). Applicable or Relevant and Appropriate Requirements (ARARs):  
State of Utah Standards, Criteria, and Limitations

Standard, Requirement, Criteria, or Limitation	Citation	Description	Status	Comment
Utah Corrective Action Policy	Title 26, Chapter 14, U.C.A.: R450-101, U.A.C.	This law relates to the clean up of RCRA, UST, and CERCLA sites. The statutory policy requiring appropriate action to eliminate the source of contamination is applicable to the selected remedy.	Applicable to OUI and OUII (action-specific).	Division of Environmental Health governs.
General Provisions and Licensing Requirements for Handling Radioactive Materials	26-1-5, U.C.A. and 26-1-27 through 26-1-29, U.C.A.: R447-12, 19, 21, and 22, U.A.C.	These provisions relate primarily to licensing requirements; they also contain some substantive standards. Example: R447-19-500 states the standards for transportation of radioactive materials.	Relevant and appropriate to OUI and OUII.	Division of Environmental Health-Bureau of Radiation Control governs.
Reclamation Plan	Title 40, Chapter 8, U.C.A.: R613-004-110, U.A.C.	This law relates to the develop- ment of reclamation plans for mined lands.	Relevant and appropriate to OUI (action-specific).	Department of Natural Resources governs.
Reclamation Practices	Title 40, Chapter 8, U.C.A.: R613-004-111	This law relates to the practices used to reclaim mined lands.	Relevant and appropriate to OUI (action-specific).	Department of Natural Resources governs.

U.S. Department of Energy  
Grand Junction Projects Office  
April 1995

## Explanation of Significant Difference

### Introduction

The U.S. Department of Energy (DOE) has prepared this Explanation of Significant Difference (ESD) to provide revised costs for the cleanup of Operable Unit I (OU I) of the Monticello Mill Tailings Site in Monticello, Utah, and revised estimates of the number of properties requiring remediation at the Monticello Vicinity Properties (MVP) Site. OU I entails the cleanup of the millsite and construction of an on-site repository for their permanent disposal.

The DOE is the lead agency responsible for the Monticello cleanup project activities. The cleanup is being conducted pursuant to a Federal Facility Agreement between the U.S. Environmental Protection Agency (EPA), the State of Utah and the Department of Energy under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), known as Superfund.

Since the Record of Decision (ROD) for the MVP Site was issued in 1989, the number of properties included for remediation has increased. Since the ROD for the Monticello Mill Tailings Site was issued in 1990, the repository cost has changed. In light of these changes, DOE is issuing this Explanation of Significant Difference, to explain the differences in cost and the increase in the number of properties. This Explanation of Significant Difference is required by CERCLA Section 117(c) and will become part of the Administrative Record file for the Monticello cleanup projects located at:

Monticello Area Office  
Abajo Building, 95½ South Main  
Monticello, Utah 84535

The Administrative Record file and Information Repository contains copies of this notice as well as other documents on the Monticello project, arranged by subject. Office hours are from 8:00 a.m. to 4:30 p.m., Monday through Friday. Special arrangements can also be made to visit the office outside of business hours and during the weekend by contacting Cyndi Eldredge at 801-587-2615.

Additional copies are located at the DOE Public Reading Room in the Technical Library at the Grand Junction Projects Office, 2597 B½ Road, Grand Junction, Colorado.

Citizens can obtain additional information by calling Joel Berwick at the Monticello Area Office at 801-587-2615, or Audrey Berry at DOE's toll-free number, 1-800-269-7145.

### Summary of Site History, Contamination Problems, and Selected Remedy

The Monticello Mill Tailings Site (or millsite) is a 110-acre tract of land located south of the city of Monticello in southeastern Utah. An estimated 1 million tons of uranium and vanadium ore was processed at the millsite from 1942 to 1960. The amount of mill tailings and contaminated soils on the site and throughout the city of Monticello resulting from this operation that will require cleanup is approximately 2.6 million cubic yards.

Tailings contain naturally occurring materials that decay to radium and produce radon, a radioactive gas. If inhaled over a long period of time, particularly in enclosed areas, radon can cause damage to lung tissue, increasing the risk of lung cancer. The purpose of the

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cleanup projects is to minimize the risks to the public and environment from exposure to the mill tailings and the radon gas they produce.

In November 1989, a ROD for the MVP Site was signed. The ROD is the document that explains the agency's reasons for selecting a particular cleanup method or remedy. The remedy selected for the MVP Site is removal of tailings from the included properties and storage on the millsite prior to final disposal in the on-site repository.

In September 1990, the EPA, State of Utah and DOE signed a ROD for the Monticello Mill Tailings Site. The remedy selected for OU I of the Monticello Mill Tailings Site is removal of the tailings, contaminated buildings, and equipment to a permanent repository. This repository is to be constructed on DOE-owned property south of and adjacent to the present millsite.

#### **Description of Significant Difference and the Basis for those Differences**

The ROD established the capital cost of the selected remedy for remediation of the millsite as \$52,100,000 (1989 dollars). This cost included site preparation, tailings removal, construction of a repository, construction management and design. The equivalent cost in 1995 dollars is in the range of \$100,700,000 to \$115,800,000, an increase of between \$48,600,000 to \$63,700,000.

The proposed on-site repository design was later determined to be unacceptable based on a performance assessment which indicated that the repository would not be protective of State promulgated ground-water protection regulations. One factor contributing to the decision to reevaluate the on-site alternative was the high cost of the repository. A secondary concern was that the repository, as it was originally designed, was not constructible. The DOE, the EPA, and the State of Utah Department of Environmental Quality

undertook a study to evaluate a number of alternatives, including the truck haul of tailings to the White Mesa facility south of Blanding. In December 1994, DOE decided to proceed under the original Record of Decision and construct a repository on the far-south site utilizing a design that ensured protection of ground water.

Specific factors contributing to the increase and the reason for the increase are described in the table on the following page.

The MVP ROD stated 204 properties were anomalous properties with 91 of these properties to be included in the MVP Site. At this time, over 400 properties are expected to be included in the MVP Site. The remediation of the properties has been divided into 5 operable units. Cleanup criteria for the properties are still the same as established in the ROD. The ROD states that the average cost of remedial action of a vicinity property is \$65,000. The current total project cost is approximately \$30,000,000, which equates to an average property cost of \$73,000. This cost increase per property is due to inflation and to an increase in the size and complexity of the more recently included properties.

#### **Support Agency Comments**

The EPA and State of Utah Department of Environmental Quality (UDEQ) concur with the Explanation of Significant Difference and concur with the implementation of the remedies at the Monticello Vicinity Properties and the Monticello Mill Tailings NPL sites. Considering the new information that has been developed and the changes that have been made to the selected remedies, EPA and UDEQ believe that the remedies will be protective of human health and the environment.

## COST GROWTH TABLE FOR OPERABLE UNIT I

FACTOR	AMOUNT OF INCREASE	REASON FOR INCREASE
Escalation	\$24,400,000	Increased cost of money estimated at 24 percent over 6 years between 1989 when the ROD estimate was completed and 1995, the current estimate. Activities completed prior to 1995 were escalated to the approximate mid-point of the activity.
Design and project oversight	\$21,200,000 to \$27,200,000	Increased complexity of the project (cell design is equivalent to design for a hazardous waste landfill), increased project duration (project was originally expected to be completed in 1997; it is now planned for completion in 2001), and additional project design and oversight requirements have been defined.
Repository size and complexity	\$3,000,000 to \$9,000,000	Revision of the tailings volume estimate based on 1991 drilling activities (increase from 1,800,000 cubic yards to 2,600,000 cubic yards) and installation of a double liner system to protect ground-water quality.
Site Preparation and Land Acquisition	\$2,800,000	Increased complexity of the drainage system, additional containment ponds, purchase of 400 additional acres at increased cost.
Tailings Removal	possible savings of over \$2,000,000	Possible efficiencies have been identified in tailings excavation, load and haul activities.

### Affirmation of Statutory Determinations

The selected remedy for OU I of the Monticello Mill Tailings Site and the MVP Site remains protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective.

The remedy does not satisfy the statutory preference for treatment which reduces the toxicity, mobility, or volume of hazardous substances as its principal element. The principal threat at the vicinity properties and the millsite will be addressed by the excavation, removal, and emplacement of the contaminated soils and materials into the proposed repository.

### Public Participation Activities

DOE will publish a Notice of Availability and brief description of this ESD in the San Juan County, Utah newspapers. A press release will also be issued to San Juan County news media. The ESD is available to the public in the Administrative Record file and Information Repository. DOE encourages residents to visit the Monticello Area Office, where the Administrative Record is located. (See Introduction for information on location and office hours.) Copies of this ESD will be available at the Area Office. The ESD will also be mailed to individuals on the Utah key contacts mailing list. DOE will accept comments on the ESD for 30 days from the date of the Notice of Availability. DOE will provide responses to any comments received to the regulatory agencies.